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ONION PRODUCTION IN VICTORIA.

S. G. Harris, Senior Potato Inspector.

The first acre of onions grown in Victoria was planted at Bellarine, in 1854, by Mr. Fred Willey, and since then the industry has made very material progress, and at present about five-sixths of the total onion production of the Commonwealth comes from this State.

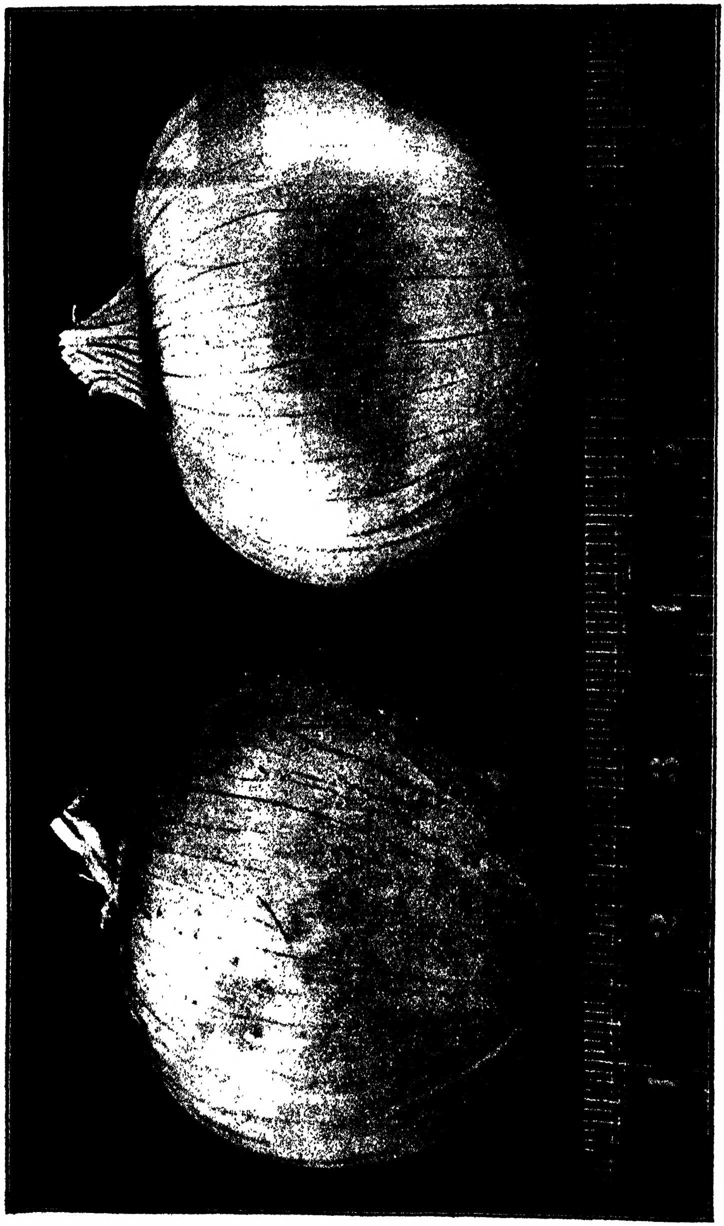
The lowest area sown in Victoria during the past twenty-two years was 2,815 acres in 1900-1901, and the highest, 9,294 acres, in 1915-1916, producing 12,766 tons and 37,587 tons respectively. This year (1920-1921) there was under cultivation 8,000 acres, which yielded 42,985 tons.

The onion is a very hardy plant, and can be grown in almost any soil and climate in garden plots for household use; but for commercial purposes the production in this State is confined to the counties south of the Dividing Range, the principal districts being Colac, comprising Nalangil, Corunnun, Cororooke, Ondit, Warrion, Alvie, Beeac, Barpamba, Weering, &c.; Warrnambool, which includes Illowa, Koroit, Crossley, and thence to Port Fairy; South Gippsland, from Poowong and Loch to Meeniyan; and the Brighton district.

Varieties.

The soil of the Brighton district, varying from light sand to sandy loam, is given up to production of the Early Globe and Silver Skin varieties, with few of the Golden Globe mixed through the Early Globe crops.

These are all early varieties, and come into the market in October, when the late varieties are becoming scarce and growthy, and supply traders' and exporters' requirements from then on till about February. None of these early varieties are good keepers, and must be market-

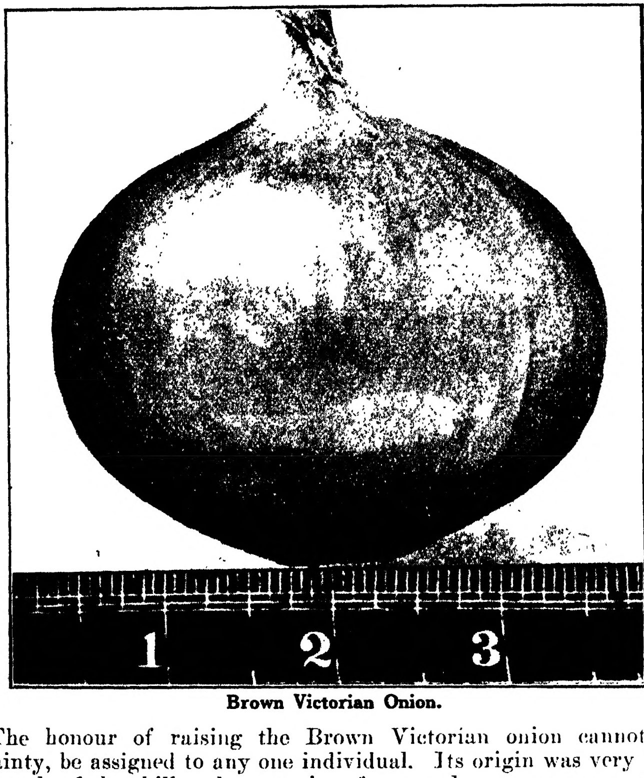


Golden Globe.

Globe.

soon after skimming. They cannot be stored for lengthy periods as can the Brown Victorian bulb.

A word of explanation relative to the last-mentioned variety is, perhaps, necessary here. It is commonly known as the Brown Spanish, but this is a misnomer, as the so-called Brown Spanish and the true bulb of that name are unlike in every particular. The Victorian is much darker in colour, is well set up with a good "shoulder," has from three to five outer skins, and is very firm in texture. The Brown Spanish is light in colour, flat on top, has a tissue-paper-like skin, and is much softer in texture.

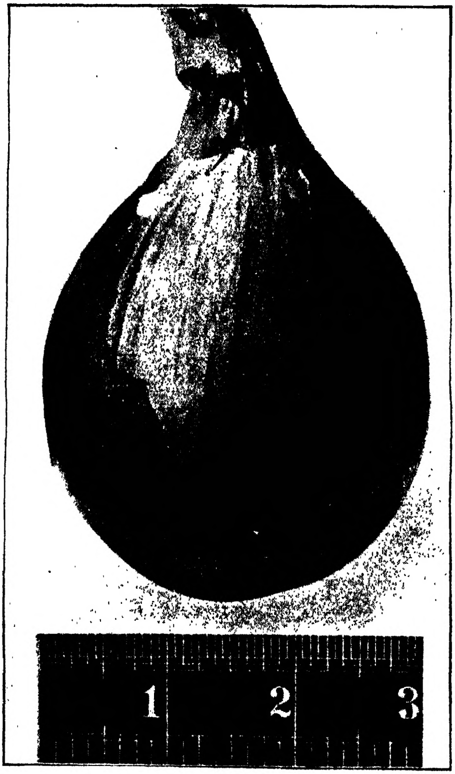


Brown Victorian Onion.

The honour of raising the Brown Victorian onion cannot, with certainty, be assigned to any one individual. Its origin was very largely the result of the skill and enterprise of our early growers, among whom may confidently be mentioned the late Mr. Levein, Mr. Henry Hibbert, and Mr. Robt. Willey, who, by cross fertilization of different varieties, produced an onion that is second to none in the world in quality and in keeping and carrying capacity. Growers in the Colac, Warrnambool, Gippsland, and other late districts practically confine their sowings to two varieties—the Brown Victorian and a Globe variety.

The Late Globe, here shown as Burns' Corunnun, is a cross between the Early Globe and the Brown Victorian, and was produced by Mr.

Andrew Burns, of Corunnun. It took about five years of careful selection and hybridization to bring the bulb up to its present state of perfection. Mr. Burns has now been growing it for ten years, and it is still proving true to type. The Late Globe should be planted only in late districts for an intermediate crop, to be ready for harvesting from about the middle of January onward. Like the Early Globe, it is not a good keeper, and should be marketed not later than May.



Burns' Corunnun (Globe Variety).

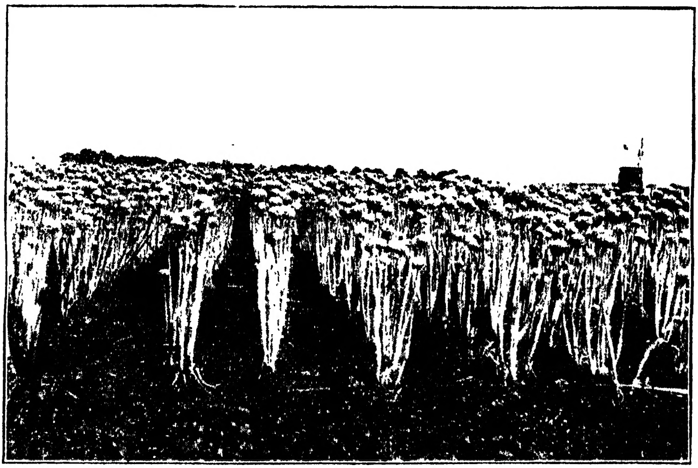
As a general rule, they will be ready to harvest fully three weeks earlier than the Brown Victorian, and, on an average, will yield fully two tons to the acre more, but if stored for any lengthy period this advantage will be more than lost through the excess of growthy bulbs which will have to be discarded when they are being prepared for the market, added to which will be the cost of regrading.

For the main crop which may be held (in part or the whole) until August or September, or even November, when prices are usually

highest, growers should be careful to plant only the best Brown Victorian variety.

Seed.

The first essential to successful production is high-grade seed that is true to type. To obtain such seed growers will be well advised to select their own bulbs, and plant their own seed plots. It may be necessary to go through several tons of good marketable onions to get a few hundredweights of bulbs fit for the seed plot. They should all be put over the screen, and only bulbs of typical shape, with good skin, fine neck, and full shoulder selected. This will take time, but it will be time well spent, and will give results that will pay handsomely. A grower who sows poor seed may expect to be always poor himself.



A Seed Plot
(Mr. Geo. Reid's, Nalangil).

To grow medium or poor quality produce is a waste of time, labour, capital, and land, and has a depreciating effect on the value of the whole industry, as it is difficult to find a market for it, and when sold is unsatisfactory to the buyer, and tends to restrict further business in that direction.

When the bulbs for seed production have been carefully selected, they should be planted in well-prepared soil, in rows from 30 to 36 inches apart, so as to give room for the free use of the horse scuffler between the rows, and the bulbs should be about 18 inches apart. Frequent use of the scuffler between the rows and the hand hoe between the sets is necessary to keep down all weeds, and in dry seasons this will also provide a fine surface mulch, and conserve the moisture in the soil.

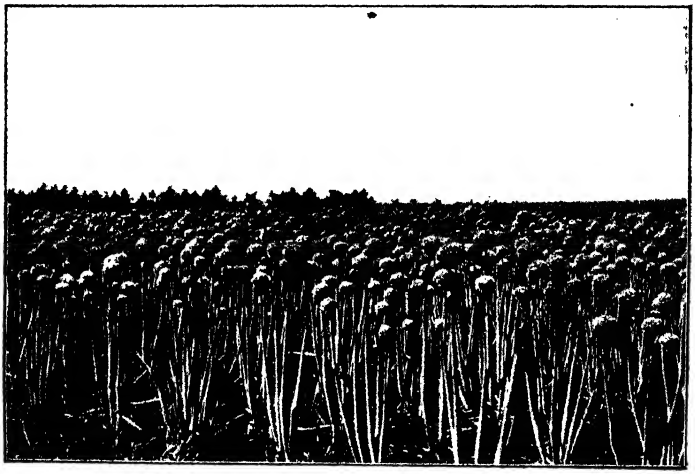
In the western districts of Colac and Warrnambool, the planting is done in the month of June; in Gippsland, about a month later. An average crop will yield about 250 lbs. of seed per acre.

Cultivation.

The second essential to successful production is proper cultivation.

The field selected for the crop should be ploughed in April or May for June planting, and not later than June for July planting. When a second crop is to be planted in the same land, the plough may be put in immediately after the removal of the first crop, and the burning of the old skins, tops, and diseased or small onions. The field should be rolled and then gone over with a heavy set of harrows or given a stroke with the spring-tooth cultivator. This work must be continued until the soil is worked into a fine tilth.

If a reasonable interval is allowed between each operation, weed seeds will germinate, and each scuffling or harrowing will destroy the weeds that have developed. Thus, a great deal of labour will be



Another Lot of Onions for Seed

(Mr. G. Reid's, Nalangil).

saved when the crop is growing and weeding operations have to be engaged in.

When the soil has been worked down to a fine tilth and levelled off, it is ready for the seeding operations, but to provide a firm seed-bed the land must be well rolled and then harrowed immediately before the seed is sown.

Except in very small plots or kitchen gardens, onions are not transplanted, but are grown by sowing the seed and thinning out when the young plants are a few inches high.

The sowing is done, usually, with two or three row seed drills, the rows being 9 inches apart, and the crop is then thinned, leaving a space of from 3 to 4 inches between each plant.

The seed may be sown in May, June, or July, and growers will have to be guided by local and seasonal conditions in their choice of the

exact period at which they commence sowing. One, two, and three row drills are obtainable, and with one of these a man can sow from one to four acres per day, according to the number of drills in the machine used and the nature of the soil on which he is operating.

The drills are adjustable, and the seed may be sown thick and then thinned, or it may be sown thin, so that very little thinning will be required. The quantity of seed necessary per acre is from 2 lbs. when sown thin to 4 lbs. if sown thick. The seed should be fresh and of the previous season's production as the viability of old seed is low and cannot be depended upon to give satisfactory results. Not only is the percentage of germination low in old seed, but the plants that do grow lack vigor. Immediately the sowing is completed the field should be well rolled.

For transplanting, the seed will need to be sown in well-prepared beds during February and March. When the surface of the bed has been worked into a fine tilth, the seed may be broadcasted very thickly, and covered to a depth of about half an inch with fine soil, and the bed may be tightened by placing a broad board on it and walking upon it, or by stroking it with the back of a spade or shovel. The plants are ready for transplanting when from 6 to 8 inches high. Before planting out, the roots should be cut back to about 2 inches, and the tops cut down to within 3 or 4 inches of the crown of the plant. If this method is adopted, about 1 lb. of seed will supply sufficient plants for an acre of crop. American growers claim that onions grown from sets will mature fully a month earlier than those grown from seed, but, owing to the greater cost of setting, only a comparatively small area is thus grown.

The young plants from seed-sown crops should begin to show up in about a fortnight, and the surface of the soil should be lightly stirred with a stroke of the "jinglers" (very light harrow). This will preserve the mulch and will also remove any young weeds that may have come through. From this period to the harvesting of the crop the field must be kept free from weeds, by hoeing between the rows and hand weeding between the sets. This continual working of the soil provides an earth mulch, and will conserve the moisture, which is essential to the growth of the crop, especially should the spring and summer be dry, as it very frequently is in the onion districts, during the growing period.

Suitable Soils.

The third essential to successful production is suitable soil. This is usually considered as of first importance, but unless the first and second essentials are fully complied with, success cannot be achieved. Even on the best land, results are dependent on cultural methods.

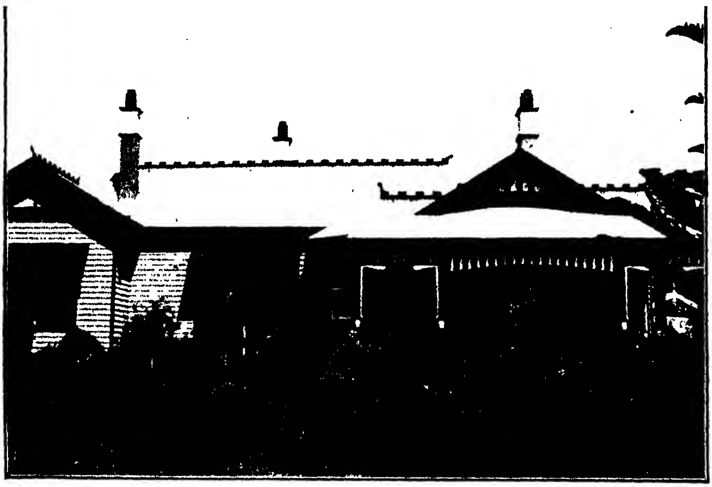
For the early crop, the sandy loam soil of the Brighton district gives excellent yields, and crops of up to 20 tons per acre have been taken from these fields. The holdings here are small, and there is an abundant supply of stable manure, and with the application of very liberal dressings this land is still giving good results after forty and fifty years of continuous use as market garden areas. The onions

grown on these light soils are, however, as already stated, poor keepers, and only suitable for immediate marketing.

For the late or main crop, the volcanic soils of the Western District and the red and chocolate loams of Gippsland are undoubtedly the most suitable in Victoria, and the onions from these districts are, perhaps, the best keepers and carriers in the world.

Onions from Camperdown, selected and graded under the supervision of the officers of the Department of Agriculture, secured the first prize and gold medal at the Panama-Pacific International Exposition, San Francisco, in 1915.

To grow onions successfully, rich soil, a moderate rainfall, and temperate climate are all necessary. In districts with a heavy rainfall, and in the drier areas, when a wet season is experienced, the bulbs



Home of Mr. Geo. Reid, a successful onion grower.

are much larger and the average yield is greater, but they are softer and lack the keeping and carrying qualities of the medium-sized bulb of the average yield, harvested in a medium season.

The soil should be well drained, and where the natural drainage is not good, pipe drainage of the field is necessary. If, however, this be beyond the financial resources of the grower, or he be a short leaseholder, the alternative is to subsoil the land by ploughing, where the soil will permit, to a depth of 8 or 9 inches. Where the soil is shallow with a clay subsoil, a subsoiling attachment may be fixed to the plough so as to follow the cut of the share in the centre of the furrow and thus loosen the subsoil, and give a drainage to a depth of 8 to 10 inches. Care must be taken to see that the clay is not turned up on to the top of the field.

Manuring and Fertilizing.

As the onion plant is a good feeder, most soils will need to be enriched with a liberal application of farm-yard manure, green manure, or artificial fertilizer.

Where farm-yard manure is used, it should be well rotted before being spread on the field, otherwise the weed seeds contained in the manure will add greatly to the labour of weeding during the growing period of the crop.

The volcanic soils of the Western districts do not respond to artificial fertilizers, and here reliance must be placed on farm-yard manure or on the ploughing in of a green crop when the soil is being prepared for a seed bed. In the rich lands of the Colac district, onions have been grown successfully for eight or ten years in succession without the use of any fertilizer. This, however, appears to the writer to be a mistaken policy, as land continuously cultivated must, sooner or later, become denuded of those essential ingredients of potash and nitrogen, and when this occurs, it will take years to bring it back to its normal state, and suitable for onion culture. Some manure should be applied to the soil yearly to make good the wastage of plant food absorbed by the crop.

In other districts bone and superphosphate is the principal fertilizer used, the quantities varying from 2½ to 4 cwt. per acre. Bonedust contains a large percentage of nitrogen, and when this is used no further application of a nitrogenous fertilizer may be required. But if the crop shows signs of weakness, additional dressing of sulphate of ammonia will be found to be very beneficial.

When applying the sulphate of ammonia, it must not be thrown on the plant, as it would burn the plant. It should be spread between the drills on the surface to the extent of from 1 to 2 cwt. per acre, and lightly worked into the soil with a rake or hoe.

The onion being a surface feeder, the food supply will be carried sufficiently deep and distributed by the first rain that falls after the application of the fertilizer.

In some of the States of America, nitrate of soda is used in place of the sulphate of ammonia, and is fed to the crop three or four times, in quantities from 200 to 300 lbs. to the acre. During the growing period, nitrate of soda, however, is not recommended, as in the event of heavy rains falling it is washed away before the plants can absorb it. Sulphate of ammonia is not so soluble, and, therefore, is less wasteful. Soils and climatic conditions differ so widely that no hard and fast rule can be laid down regarding the kind and quantity of fertilizer to use, and the grower must be guided very largely by what experience has found to be most suitable for his district.

(To be continued.)

WEEDS AND THEIR ERADICATION.

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

(Continued from page 714, Vol. XIX.).

Control by Grasses.

The fact that grazing is often of great value in assisting grasses to overcome St. John's Wort can be noticed on roadsides in the Bright district wherever grass is plentiful enough to attract stock. Cattle in their endeavours to get at the grass bite off any shoots of the wort that are present; this continual nipping off weakens and ultimately kills the plants. But where rabbits are numerous they always favour the growth of the wort. These animals, on account of their small size, can be selective in their feeding, and they always leave the wort untouched while eating out the grasses that would otherwise compete with it. Thus although feeding off wort-infested lands by stock assists very materially in the control of this weed, the presence of rabbits has always just the opposite effect.

Should there be much St. John's Wort present it would be advisable to first mow and rake it off before putting stock on the land, as its effects might be hurtful. Risk of harm, however, may be greatly minimized by seeing that the animals always have free access to an abundant supply of salt.

Although Kentucky Blue Grass (*Poa pratensis*) has so far given the best results of any of the grasses tested, there are others that should prove equally as good. *Paspalum dilatatum*, unfortunately, was not a success under the poor cultural conditions obtaining on the plots at Bright. If, however, the ground were first properly prepared and the grass well established, it would certainly overcome St. John's Wort. In places unsuitable for cultivation rooted plants of this grass could be sown.

Fig. 9 shows a plan of the grass plots in the Morgan's Creek and Porepunkah Pine Plantations. The grasses giving the most promise, in their order of merit for wort-control purposes, are as follow:—

Kentucky Blue, *Poa pratensis.*
Hard Fescue, *Festuca duriuscula.*
Cocksfoot, *Dactylis glomerata.*
Red Creeping Fescue, *Festuca rubra.*
Crested Dogstail, *Cynosurus cristatus.*

Some of the grasses such as *Phalaris bulbosa* and Burr Clover, *Medicago denticulata* gave great promise of success last season, but this season they have been completely dominated by St. John's Wort, which has again obtained complete possession of the ground. Even such an aggressive plant as Johnson Grass, *Sorghum halapense*, has had a great struggle and has for the most part died out. Sudan Grass, *Andropogon Sorghum*, and Russian Millet did not appear at all after being sown. Some of the grasses were undoubtedly frost-killed, as frosts were frequent and of exceptional severity, often raising the ground into ridges, thus drying out the young plants.

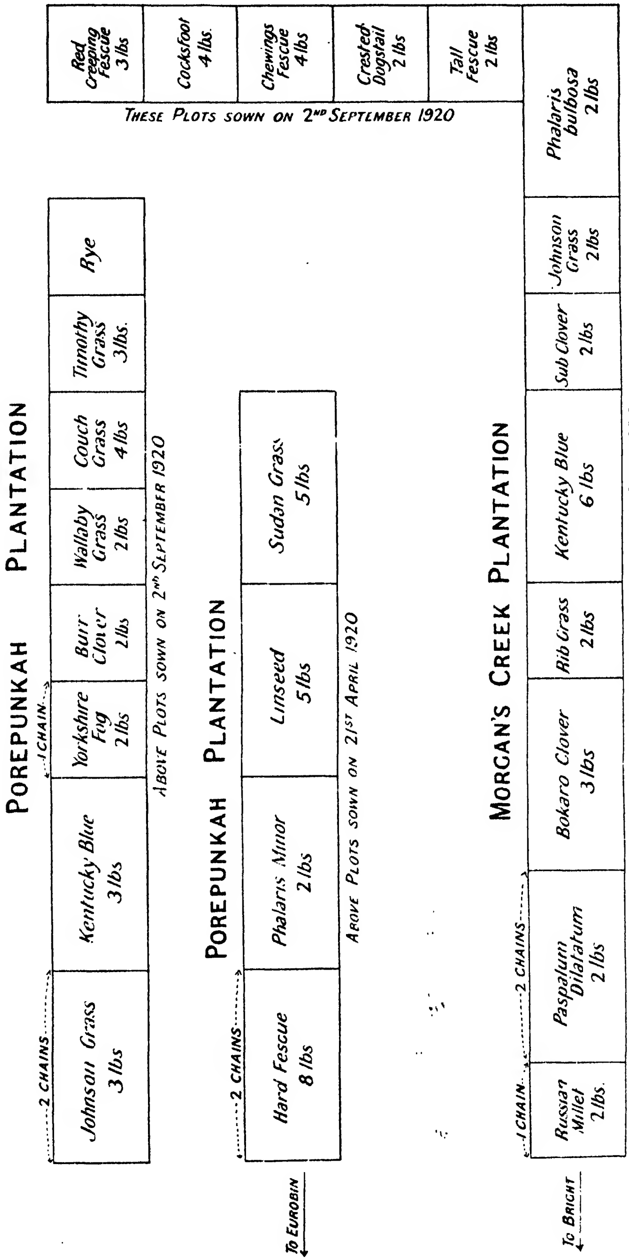


Fig. 9.—Test Grass Plots at Bright for Control of St. John's Wort.

These grass tests, although as yet inconclusive, certainly point the way in which it is hoped that St. John's Wort can be controlled

Fig. 10.—Common Tutsan *(Hypericum Androsoemum).*

from spreading from Crown lands to the lower country yet free from this pest. A belt of strong growing grasses, once properly established,

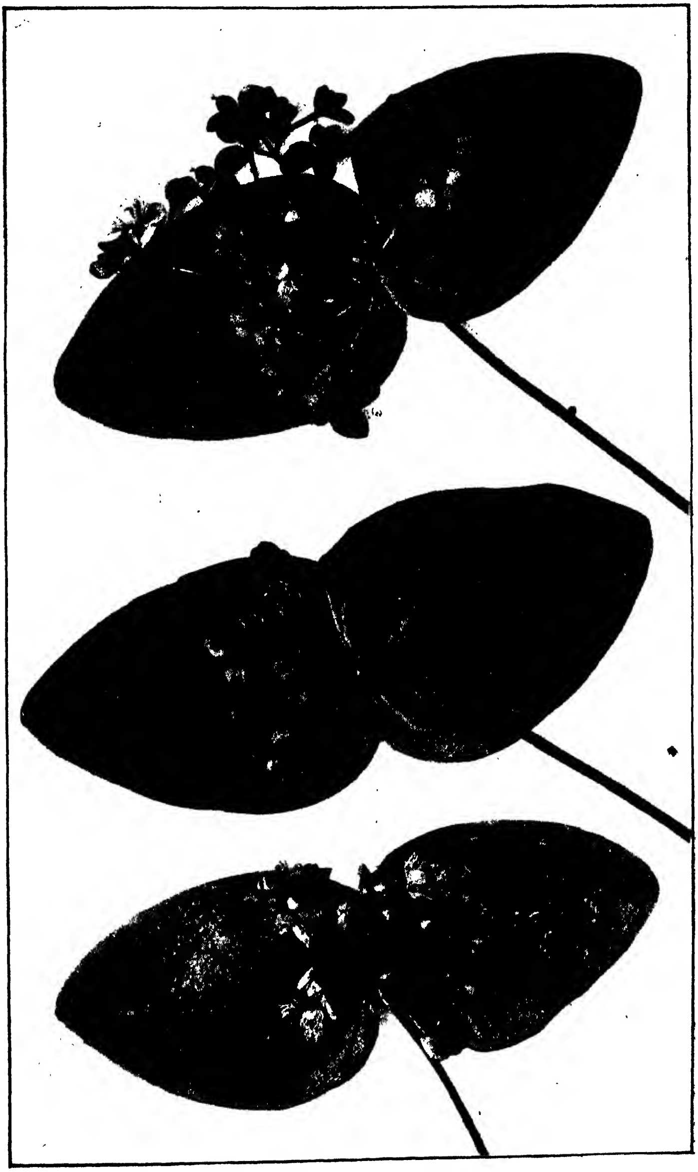


Fig. 11.—Flowers and Seed Capsules of Tutsan.

would act as a buffer between lands owned by the Crown and those privately held. These belts would intercept and hold seeds from the wort on higher country, and so prevent them from being washed down during heavy rains. Useful as would be these protective belts of strong grasses, they would be of little value unless a crusade against rabbits was carried out at the same time. It would also be necessary to exercise some control over the movements of stock in infested areas at the time when the wort is bearing ripe seed. The same may be said of the removal of farm produce likely to carry seed with it to a clean district.

Fig. 12.—Flowers of *Hypericum Calycinum*.

In the case of land-owners whose land is unfortunately growing this pestilent weed, providing the patches of weed are small, it could be effectively killed by covering the plots completely with sheets of bark or iron. These should overlap sufficiently to exclude all light. In places where timber is plentiful, St. John's Wort can be successfully destroyed by stacking wood on the patches of weed and firing them.

Larger areas should be hand-pulled or mown, the former method being preferable as having a much more weakening effect on the plant than mowing. Salt applications should afterwards be made during hot weather or, as soon as new shoots appeared, they might be sprayed with arsenic, crude petroleum, or brine. But whatever preparation

Fig. 13.—*Hypericum Calycinum.*
New plants being formed at ends of underground stems.

Fig. 14.—*Hypericum Calycinum.*
Three distinct plants arising from same underground stem.

is used on standing plants, it is best applied when the flower stems have appeared, but before they have opened, as the most important thing in the control of this plant is to prevent it from ripening its seed.

On lands that can be cultivated the difficulties attending the eradication of St. John's Wort, although very considerable, are much less than on land fit for grazing purposes only. Crops requiring cultivation during their growing period, such as potatoes and tobacco, are excellent for destroying weeds of all sorts, and the growing of such crops should be of great help in combating this weed. Cereal crops are almost useless for the purpose, as while they are growing, the roots of St. John's Wort will be recovering from the cultivation previously given, so that by the time the crop is ready to harvest the wort will have recovered its vigour, and thus may continue year after year as long as cereal crops are grown on wort-infested land.

The Common Tutsan (*Hypericum Androsæmum*).

This handsome perennial (Fig. 10) is a native of Europe, and is a fairly common plant in Devonshire and Cornwall in England. Unfortunately, like many other introductions into Victoria, it is becoming much too plentiful. In the southern parts of the State, especially in the rough country lying between Forrest and Apollo Bay, Tutsan is now very prevalent. Owing to its great spread during recent years, it has been proclaimed a noxious weed under the Thistle Act for the whole State.

Tutsan is a shrubby plant of striking appearance, growing from 3 to 4 feet high, and is much more robust in appearance than the Common St. John's Wort, *Hypericum perforatum*. The leaves of Tutsan (Fig. 11) are large, egg-shaped, and sessile. During the spring and early summer months its clusters of large yellow flowers make it a conspicuous object. This plant produces a great quantity of small seeds, enclosed in glossy, berry-like capsules, which no less than the flowers are very conspicuous objects, and make it a very easy matter to locate the plant.

The best method of dealing with Tutsan is by hand-pulling it while it is young, and when the ground is in a moist condition. With old-established plants hand-pulling is often difficult owing to their strong woody roots. The best way to get rid of such plants is by grubbing them out with a mattock.

The fact that Tutson belongs to the same genus (*Hypericum*) as the Common St. John's Wort should be a sufficient warning to landowners to destroy it as soon as its presence is discovered.

The Large-flowered St. John's Wort (*Hypericum Calycinum.*).

The large-flowered St. John's Wort has recently brought itself into prominence by threatening to become a very serious pest. It is probably among the handsomest of the Hypericums, having a large yellow flower nearly 3 inches across (Fig. 12). In appearance it is very much like the garden plant *Hypericum Moserianum*, the latter it is stated being a hybrid and *Hypericum calycinum* one of its parents.

Hypericum calycinum is rather a dwarf species, and here it does not usually grow higher than 15 inches. Its leaves are opposite, sessile, and about 2½ inches long by 1 inch in width with reddish stems

of a hard woody nature. It is a most difficult one to deal with, as it sends out long subterranean creeping rootstocks, and these send up fresh shoots at intervals. Fig. 13 gives an excellent idea of these underground runners, with leaves just commencing to develop at their

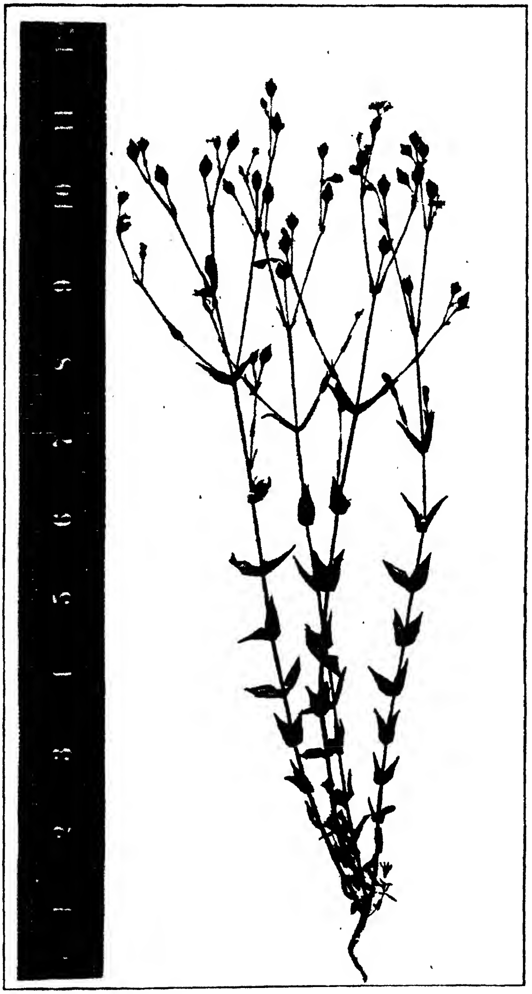


Fig. 15.—The Native Species of St. John's Wort (*Hypericum Japonicum*).

extremities. Fig. 14 shows three distinct plants all attached to the same underground stem, with running rootstocks starting away from these to again form new plants. This, like most of the Hypericums, is a heavy seeder. It also grows very freely from any small piece

of the plant (either stem or root), and in addition possesses creeping rootstocks. With these attributes it is almost certain to become a very dangerous pest plant unless it is killed out immediately. Plants that have creeping rootstocks are always hard to eradicate, as where there are rootstocks hand-pulling is useless, the plant merely breaking off where it is attached to the parent stem, leaving the latter unimpaired and capable of sending up in a very short space of time shoots to replace those pulled.

Hypericum calycinum should be very carefully dug out, and all parts of it collected and burnt. The places in which it grew should be carefully watched for any new shoots from pieces of roots or stems that may have been overlooked, so that on their first appearance they could be destroyed.

This Hypericum is fortunately not a common species in Victoria, and the writer is indebted to the officers of the National Herbarium for its identification. Patches were found growing in the Old Gisborne Cemetery, mostly on grass lands, and also at Mount Macedon, where steps have now been taken for its complete eradication. Fig. 15 shows our small native species of St. John's Wort, *Hypericum japonicum*. This is figured because it is so frequently mistaken for the pest species by people unfamiliar with the appearance of that plant. The Native St. John's Wort is a common plant in the mountainous parts of north-east Victoria, and seldom grows to more than 15 inches high, and is not there considered to be a harmful weed.

(To be continued.)

SCORE-CARDING THE LAYING FOWL.

By A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

The September, 1921, issue of *Utility Poultry Journal* (England) gives a very interesting report of three systems of score-carding the laying hen, as propounded by their respective exponents—

I. The "Powell-Owen" System of Grading and Handling, by Mr. W. Powell-Owen, of the National Utility Poultry Society.

II. The National Poultry Club Service System, by Captain Pierson Webber.

III. The Midland Federation Score-Card, by Mr. A. H. Brain.

Each of the afore-mentioned gentlemen in addition to explaining his methods had the opportunity of going over a total of 48 birds, representing twelve specimens each of Rhode Island Reds, Light Sussex, White Wyandottes, and White Leghorns; the actual trap-nest record of each specimen had been previously recorded, but not made known to the "score-carders." As Mr. Powell-Owen's card scores a maximum of 200 points in all, Captain Pierson Webber's 110, and Mr. Brain's 100, the writer has given the figures in percentages, in order to simplify comparison, as well as the placings in each section. The three score-card systems are given herewith, but it should be borne in mind by the reader that owing to the sad loss of sight from which Captain Pierson Webber suffers, he has to be guided entirely by sense

of touch, in consequence of which he has a much more limited sphere of operation than the other two gentlemen.

THE THREE SYSTEMS.

CAPT. PIERSON-WEBBER'S CARD.

Condition.	Capacity.	Texture.	Type.	Total.	Plumage.	Grand Total.	Remarks.
25	25	25	25	100	10	110	

DEFINITIONS.

By "condition" is meant (A) Suitable weight for age, sex, and breed. (B) Vitality and persistency, being that power which is inherent towards strong constitution and recuperative action. (C) Bloom and cleanliness of feather, horn, skin, and flesh. (D) Seasonable precocity and fertility.

By "capacity" is meant that proportionate length, width, and depth, which provides ample room for the development of the ovaries as well as freedom of action for heart and lungs.

By "texture" is meant the hereditary refinement of horn, bone, skin, flesh, and feather.

By "type" is meant the careful adjustment of points of utility merit, to meet essential breed characteristics, so as to conserve as far as possible the work of the fancier and at the same time eliminate all that upsets true proportion and texture.

MR. BRAIN'S CARD.

Utility Characteristics.					Ideal Standard Value.	Score.
Condition	Weight Size	Active, Vigour Healthy			10	
Head	Eye Comb	Lobes Wattles	Face Beak	Skull	10	
Back	Length Width				10	
Breast	Shape Length and Proportion	Straight			5	
Body	Formation Fluff and Feather				10	
Wings Tail	Legs Toes	Scales			5	
Texture					20	
Abdominal Capacity		Pubic Bones to Keel			15	
Pubic Bones	Gap (absence of meat, gristle, and fat) Straightness and Type				15	
		Total			100	

MR. OWEN'S CARD.

Capacity.	Fingers.	Points Possible.	Points Awarded.	Capability.		Points Possible.	Points Awarded.
End of breast bone to pelvic	1	4		Pelvic bone ..	v. thick	3	
	2	8			thick	6	
	3	12			thin	9	
	4	16			v. thin	12	
	5	20			If straight add	3	
Between pelvic bones	2	2½		Flesh	coarse	5	
	3	5			medium	10	
					fine	15	
Between pelvic and tail bone	1	5		Vent	size	5	
	2	10			fineness	5	
Width of back ..	medium	3		Head-points ..	medium	3	
	good	6			good	6	
	v. good	10			v. good	10	
Length of back ..	medium	2½		Bone and horn ..	coarse	3	
	good	5			medium	6	
					v. good	10	
Width between legs	medium	3		Feather ..	excess	3	
	good	6			medium	6	
	v. good	10			ideal	10	
Length, depth, and width of abdomen	medium	3		EXHIBITOR—			
	good	6					
	v. good	10					
Total		70		Total		70	

Breed Characters, &c.	Points Possible.	Points Awarded.	Grand Total.	Points Possible.	Points Awarded.
Show condition	10		Capacity	70	
Health	10		Capability	70	
Size (ideal utility) ..	10		Breed characters, &c. ..	60	
Breed characters	30				
Total	60		Total	200	

The Result of Score-card Judging.

RHODE ISLAND REDS.

Percentage of Points.

—	Actual Record in Eggs.	Brain.	Webber.	Owen.
No. 13	274	65½	67	66
" 7	216	80½ (3rd best)	74 (res.)	78
" 10	192 (nine months)	73½	73 (v.h.c.)	79
" 3	196	78½ (v.h.c.)	72 (c)	86 (1st)
" 4	195	71½	73 (h.c.)	79
" 9	191	74½ (c)	86 (1st)	81½ (v.h.c.)
" 11	189 (nine months)	71	77 (3rd)	83 (res.)
" 2	185	82 (1st)	73 (h.c.)	81 (c)
" 6	188	80 (2nd)	80 (2nd)	84 (2nd)
" 8	184	78½ (h.c.)	71	81 (h.c.)
" 12	179 (nearly nine months)	73½	66	83½ (3rd)
" 5	175 (nine and a-half months)	80 (res.)	68½	80

The three judges in the above section all failed to find the only decent layer there, and failed to agree amongst themselves in the placings of moderate layers, none of which would be considered worth breeding from in Australia.

LIGHT SUSSEX.

Percentage of Points.

—	Actual Record in Eggs.	Brain.	Webber.	Owen.
No. 15	222	68½	82 (2nd)	74½
" 18	222	74	67	82½ (res.)
" 21	212	72½ (c)	61½	74
" 25	207	74½ (h.c.)	79 (res.)	75
" 17	180	77 (2nd)	68½ (h.c.)	78
" 16	175	75½ (v.h.c.)	68 (c)	77½
" 14	171	66	66	83 (2nd)
" 19	160	70½	77½ (v.h.c.)	77
" 24	160	78½ (1st)	35½	74
" 22	156	65	49	..
" 20	155	76½ (3rd)	81½ (3rd)	82¾ (3rd)
" 23	148	76 (res.)	84½ (1st)	83¼ (1st)

In this section again the judges more or less missed the best birds, and selected the worst.

WHITE WYANDOTTES.

Percentage of Points.

—	Actual Record in Eggs.	Brain.	Webber.	Owen.
No. 36	191	72	66	..
„ 41	191	81½ (1st)	76½ (res.)	83 (2nd)
„ 38	190	72½ (c)	68 (c)	..
„ 45	189	74 (v.h.c.)	59	76¾
„ 39	175	64	65½	80¼ (res.)
„ 35	162	72½	67	80¼ (res.)
„ 43	156	81 (2nd)	79½ (2nd)	82 (3rd)
„ 42	140	71½	68½ (h.c.)	76¼
„ 34	139	65½	84½ (1st)	71¾
„ 37	133	73½ (h.c.)	74 (v.h.c.)	79¾ (v.h.c.)
„ 40	127	77 (3rd)	78 (3rd)	85¾ (1st)
„ 44	122	75 (res.)	66	74½

The judges were more successful apparently in getting on to one of the two highest scorers, but again seemed to have a fancy for the poor layers.

WHITE LEGHORNS.

Percentage of Points.

—	Actual Record in Eggs.	Brain.	Webber.	Owen.
No. 74	187	70½	78½ (h.c.)	86½ (v.h.c.)
„ 77	174	80 (3rd)	90 (1st)	88¾ (2nd)
„ 68	170	83 (1st)	79 (v.h.c.)	88 (3rd)
„ 76	165	78 (v.h.c.)	72	86½ (res.)
„ 71	155	64½	24	..
„ 70	151	66½	85½ (2nd)	81¼
„ 75	150	71½ (c)	82 (3rd)	78¾
„ 78	145	80½ (2nd)	74 (c)	84
„ 79	137	73½ (h.c.)	71	85¼ (h.c.)
„ 73	132	70½	80 (res.)	73½
„ 69	119	80 (res.)	67½	89 (1st)
„ 72	116	57	68	73½

In this section the judges seemed more at home with the 2nd, 3rd, and 4th birds, but again Mr. Powell-Owen's "system" seemed to attract about the worst layer for first prize, as in three different sections he awarded first prize with 89 per cent., 85¾ per cent., and 83¼ per cent. to birds that had laid 119, 127, and 155 eggs respectively, whereas a bird that had laid 274 was only accorded 66 per cent. One cannot help wondering what marks would have been accorded to Mr. C. E. Graham's world's record, 335 egg bird on the "Powell-Owen" system?

Captain Pierson Webber claims for his system, introduced in 1917, that it was the first known in Great Britain, the other systems being evolved later. In 1916, however, the Department of Agriculture, Vic-

toria, laid down the standard for "utility" points, which is as follows:—

Utility Breeds.

General Appearance.—Bright, active, and healthy. The first essential a well developed, vigorous constitution, giving evidence of ability to transmit similar qualities.

Head.—Rather long in light breeds, and lean, narrowing somewhat at the back of the skull. Heavy breeds shorter in skull, and fractionally deeper.

Eyes.—Full and bright. Colour rich orange red, except in case of certain breeds such as Black Orpington, Langshan, Minorca, &c., when eyes should be dark brown almost to black.

Face.—Bright and clean. Free from feathering.

Comb.—Thin and fine in texture, thickening as little as possible towards the base. Dubbing to be recognised in the case of second season, or older roosters in the light breeds.

Wattles.—Thin, and of finest possible texture.

Neck.—Fine and fairly long.

Body.—Long, deep, and wedge-shaped, similar to that of the milch cow, wide across the saddle.

Breastbone.—Straight and fine.

Pelvic Bones.—Thin, pliable, fairly long and straight, set at considerable distance from point of breastbone.

Skin.—Texture of skin of abdomen to be of thinnest and finest quality, very elastic.

Legs.—Not high, and set well apart.

Tail.—Full and flowing, not set at too high an angle, with good sickle and hackle feathers.

Feathers.—Profuse, but close and flat on the bird.

Weight (Minimum).—Six months pullets, White Leghorns, 3½ lbs. Six months pullets, Black Orpingtons, 5 lbs. Others in proportion.

PRINCIPAL LIGHT BREEDS.	PRINCIPAL HEAVY BREEDS.
Ancona.	Faverolles.
Andalusian.	Langshan.
Campine.	Orpington.
Hamburgh.	Plymouth Rock.
Leghorn.	Rhode Island.
Minorca.	Sussex.
Sicilian Buttercup.	Wyandotte.

Australian poultry breeders, to whom scores of 240 to 270 are the merest every-day affair (and being quite familiar with birds going well over the 300), will disagree with Mr. Brain's allowance of only 10 per cent. in all for eye, comb, lobes, wattles, face, beak, and skull, many breeders attaching fully a third of the total value of the bird to head properties alone. At any rate, no one would be at all likely—in Australia—to agree that the abdominal capacity from pubic bones to keel should count half as much again as the head properties, *i.e.*, 15 per cent. for capacity against 10 per cent. for head properties! No less than ten out of the forty-eight birds examined by Mr. Brain scored 80 per cent. or higher. It is commonly reported of Mr. George Raper (one of the ablest all-round, living judges of dogs) that the *best* dog

of all breeds *he ever saw* would have scored about 75 per cent. on the score-card. If the ten birds therefore whose records averaged about 173 could score from 80 per cent. upwards, what score can be credited to the 300-egg bird?

One of the secrets of score-card judging is to leave ample margin *in case* the perfect specimen should ever appear. Not long ago a well-known judge told the writer that it once fell to his lot to have to score-card game bantams. He valued the winner of the first class at 68 per cent., but as time went on, in subsequent classes, he unconsciously lowered his standard, thereby raising his marks, with the result that the winner in the last class scored over 90 per cent. A valuable silver cup was on offer for the best in the show, for which he unhesitatingly selected the 68 per cent. winner, and protests that the highest scorer should be given the prize met with the response from the judge that whatever the scores were, "68 per cent. was the best bird." It is extremely doubtful if there exists any poultry enthusiast who could score-card 40 utility birds twice running in the same order, even let alone being able to allot the same number of marks to each bird on the second occasion.

The score-card is merely a guide as to the proportionate value of the different characteristics to enable the novice to get some idea of value; to the experienced breeder *who knows*, it is more of a hindrance than help, as the most important point of all—BALANCE—is almost invariably omitted. Two specimens may vary in this respect, one may be good in each *individual* characteristic, but by being out of balance would be of less actual value than the other specimen, which, while not perfect in any characteristic, is symmetrically balanced.

To the writer, however, the "Powell-Owen" system is distinctly the least valuable of the three systems, the mathematical system of measurements in any utility poultry score-card being abhorrent. To start with, the "Powell-Owen" system only allows a five-finger capacity from end of breastbone to pelvic bones. What of those birds that measure six, and, on occasion, seven fingers? Consider also the width between the pelvic bones—a maximum of three fingers—whilst in Australia thousands of birds can be found that measure four fingers!

The writer has never yet found that much reliance can be placed on these measurements, the principal objection being their extreme variability from week to week in the same bird. It is doubtful if the score-card will ever help us either to discover in the saddling paddock at Flemington the winner of the Melbourne Cup, or at Burnley the 350-egg bird!

Crop Capacity and Constitution.

A feature of the three systems is that not one of them refers to "crop capacity." Doctors differ, and so do poultry experts, but the majority of experienced egg farmers are agreed that fully 75 per cent. of the value of the bird can be determined on inspection without handling; in other words, "ground picking" is infinitely superior to handling for measurements. *Egg record alone is the worst possible system of breeding any one can adopt*; that way is certain disaster. Constitution must always come first, and a weakly, delicate bird is of no breeding value, whatever her score might have been.

Unless there is crop capacity to receive and commence digestion of the heavy feeding that is essential in order to maintain the enormous output of eggs under "test" conditions, she would not be likely in the subsequent breeding years to be the mother of healthy, vigorous chickens. The bird, therefore, that "cuts away in front" should be omitted from the breeding pen, and in consequence should never be given the opportunity of trap-nest or single pen.

EXPLANATION OF POINTS IN SELECTION.

Fineness of Skull.—As the skull will undoubtedly thicken with age, fineness is necessary for a good layer, coarseness not being compatible with consistent laying. The heavy breeds should be shorter in skull than the light breeds, as the long-headed heavy breeds are liable to weaker constitution, earlier moult, and inability to go on laying right through the moult.

Eyes.—Full and bright. Roundness and prominence of the eyes are indicative of vitality and fecundity. With age the eye sinks into the skull, hence the necessity to avoid much space from the eye to the back of the nostril, which would increase the orbital cavity.

Face.—Bright and clean, free from feathering. Experience has shown that the best layers are invariably clean faced.

Comb.—The comb thickens with age, and also with excessive meat feeding, so that stud roosters—meat fed—are usually dubbed to avoid the unnecessary drain on the system in the shape of blood required to support a large comb, but, though simple and harmless, this operation is positively prohibited in Great Britain.

Neck.—Fine and fairly long in order to preserve fineness and quality. A short-necked bird is usually thick-necked and coarse.

Body.—Spring of rib is desirable, a flat-sided bird is usually of weak constitution.

Breastbone.—Straight and fine, a crooked breastbone being an indication of hereditary weakness. It should be observed that a crooked breastbone is by no means the same as an indented breastbone caused by too early perching.

Pelvic Bones.—Scant importance need be attached to the distance between the bones themselves, which depends to a certain extent on the proximity of the laying of the next egg. Fineness of the bones depends somewhat on age, which causes a gradual thickening. It is by no means uncommon to find one bone thicker than the other, in which case the writer has usually found the right pelvic the thicker of the two. Incurvation is frequently met with, and can easily be caused by overcrowding of chickens in the brooder, the bones being easily distorted at an early age. If there is any value at all in handling the birds, it is then of the utmost importance to also handle the male bird. "Like begets like," and the result of running a poor spaced male with good spaced hens can be gauged by "Mendelism."

Skin.—The texture of the abdomen varies in accordance with the laying condition of the hen, but fineness and pliability are very desirable. Dairy cattle buyers will—in the market—test the fineness and pliability of the skin on the ribs of a cow, any tendency to being hidebound, or even coarse-skinned, being a common cause of rejection.

Feathers.—The tighter or closer-feathered the bird is, the warmer she will be in winter. Consequently will require less food to maintain body heat, and more will be available for egg production. The loose-feathered bird is more liable to moult early, and will not lay through the moult, as she loses all her feathers at once. A good layer will go bare and red about the head, but moults gradually, the new feathers working through the old, causing less drain on the system, and enabling her to continue laying. The full "quill" moult leaves the bird colder, and makes a drain on the food supply—a drain accentuated by the formation of a complete set of new feathers all at the one time.

. . . .

Relying on the Victorian system of selection, it was possible to predict the first 300-egg bird in public test in this State, whilst the following year, on the same system, it was confidently expected of Mr. C. E. Graham's 335-egg bird, even before she laid an egg, that she would make a record.

The Indian Government has imported from Victoria birds that have defeated all British importations in the laying pens, and undoubtedly there is ample room for an enormous trade in stud birds between Australia and Great Britain.

The prices quoted for typical layers of vigorous constitution usually do not exceed about £3 3s. for females and £5 5s. for males, so that there is nothing to prevent the English breeders importing some of the actual stock that have made Australian fowls famous throughout the world, a state of affairs largely brought about by a fairly thorough understanding in the first instance of how to select breeders; secondly, how to select layers; and, lastly, how to feed to get the best results.

An exchange of ideas from opposite ends of the world can do no harm, and if better methods of selecting the most profitable layers can be arrived at by "eye" selection—the natural British method of judging the value of all live stock—then the poultry industry in general must reap the benefit.

CROP AND FALLOW COMPETITION, MINYIP, 1921.

Report of Judge, J. Keane, B.Ag.Sc., Science Field Officer.

The crop and fallow competition conducted by the Minyip Agricultural and Pastoral Society this year comprised four sections, for which a total of twenty entries was received.

Seasonal conditions throughout the Wimmera have, this year, been eminently suitable for wheat-growing, and some excellent crops have been produced. Those seen at Minyip were particularly heavy, and high yields should be obtained throughout the district. In fact, so uniformly prolific were the crops, that considerable difficulty was experienced in placing them in order of merit.

Details of Results.

SECTION 1.—BEST HALF OF FARMER'S WHEAT CROP—NOT LESS THAN 50 ACRES.

Name.	Yield.*	Trueness to Type.	Evenness.	Disease.	Weeds.	Total.
Possible Points	**35**	**20**	**15**	**15**	**15**	**100**
A. H. Krelle *	35	18	15	11	14	93
Murphy Bros.	35	19	14	10	14	92
H. A. Niewand	32	17½	13	14	12½	89
Boschen Bros.	28	19	13	14	12½	86½
J. A. Pipkorn	29	17	12	15	13	86

* In connexion with points allotted under "Yield," it should be noted that these do not correspond with the estimated yield in bushels. The method adopted is to award the highest yielding crop the full points, *i.e.*, 35, and with the remaining crops to take off one point for each bushel difference in the estimated yield. The estimated yields were in each case higher than the figures shown.

The winning crop in this section was that of Mr. A. H. Krelle, of Coromby. It consisted of a 112-acre paddock of Federation. It was a very heavy crop, well headed, even, reasonably true to type, and with few weeds. Portion of the crop was grown on summer fallow, the land being scarified in March and again in September. The balance (62 acres) was ploughed in August and harrowed twice in September. The whole of the paddock was scarified in October and again in November. It was harrowed in November and again early in December after rain. At the end of January and in May it was worked with the spring-toothed cultivator. Early in July it was sown by means of the combined spring-toothed cultivator drill and then harrowed. Seventy-five lbs. of seed and 120 lbs. of superphosphate per acre were used. Since 1915 this paddock has been sown to wheat every second year, four crops having been taken off in the last seven years.

Factors which probably contributed to the success of this crop were the thorough working of the fallow, the heavy seeding, and the liberal dressing of manure. In this connexion, it is worthy of note that in the experimental plots at Longerenong College 75 lbs. of seed with up to 2 cwt. of superphosphate has given the most profitable results.

The second place was awarded to Messrs. Murphy Bros., of Burrereo, for a very fine crop of 120 acres of Federation. Only a very few "strangers" were present; the crop was very even and comparatively free from weeds. As with Mr. Krelle's crop, portion of this was sown on summer fallow and portion on winter fallow. That portion on summer fallow promised to yield a little heavier than the latter. The working of the paddock, which is mainly black land with a few red patches, was as follows:—Forty acres were summer fallowed in April by means of the skim plough; it was then left till July, when it was scarified, harrowed, and cross-harrowed. It was next scarified early in October and again twice harrowed. It was then harrowed in December and again in April. The remaining 80 acres were skim-ploughed in July, followed by a harrowing and cross-harrowing, scarified in September, again harrowed and cross-harrowed, harrowed again in December, and then harrowed twice towards the end of March. The

whole paddock was then scarified and drilled with the combined drill in July. It was harrowed after the drill. Sixty lbs. of seed and 90 lbs. of superphosphate per acre were used. In addition to this crop, Messrs. Murphy Bros. showed 127 acres of Federation sown on a well-worked winter fallow.

The Winning Crop—Mr. A. H. Krelle's 112 acres of Federation.

Messrs. Murphy Bros.' Fine Crop of Federation.

Mr. H. A. Niewand's crop of Federation was placed third. This consisted of two paddocks each of 60 acres, and both summer fallowed. The ploughing was done in March, and both paddocks were scarified in July, and harrowed. They were then scarified in October, and in February were harrowed after rain. They were again scarified in April and again in June, after which 65 lbs. of seed and 112 lbs. of super. were drilled in. The drill was followed by the harrows. The rotations practised on these two paddocks over the last four years have been, respectively: (1) Wheat, oats, fallow, wheat; and (2) Wheat, grass, fallow, wheat. The crop, which promised to yield well, contained a fair number of "strangers," and was slightly affected with "flag smut."

A nice crop of 90 acres of Federation was shown by Messrs. Boschen Bros., but it was much lighter than either of the placed crops. The seed, which was obtained from Longerenong College four years ago, is fairly pure, only a very few foreign varieties being present. The paddock was summer fallowed in March. Seventy lbs. of seed and 90 lbs. of superphosphate were sown during the second week in June.

Mr. J. Pipkorn, of Burrereo, exhibited 65 acres of Federation sown on summer fallow, which was skim-ploughed in March and again in August, harrowed twice in September, scarified and harrowed in October, harrowed again early in February, then scarified and drilled about the end of June. The land was harrowed after the drill. Sixty lbs. of seed and 112 lbs. of super. per acre were sown.

A Heavy Crop of Penny—Mr. P. C. Schultz, Kewell.

SECTION 2.—FOR THE BEST CROP ON FALLOWED LAND—THE FALLOW JUDGED 1920, AND THE CROP ON THE FALLOW 1921.

In this section the fallow (not less than 100 acres) was judged by Mr. H. A. Mullett, B.Ag.Sc., in 1920. The points awarded for the fallow are added to the points obtained by the crop grown on that fallow.

DETAILS OF RESULTS.—SECTION 2.

Name.	Yield.*	Trueness to Type.	Evenness.	Disease.	Weeds.	Total for Crop, 1921.	Total for Fallow, 1920.	Grand Total.
Possible points ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
A. H. Krelle ..	35	18	15	11	14	93	99	192
A. D. McGilp ..	32	18	14	15	14	93	94	187
A. Lutze ..	32	18½	15	13½	11	90	88	178
H. A. Niewand ..	32	17½	13	14	12½	89	89	178
P. C. Schultz ..	32	17	13½	13½	12	88	89	177
R. J. Cowan ..	28	16½	12½	14	12½	83½	88	171½
F. Burton ..	29	19	13	13	13	87	80	167

* See note under Table I.

The crop shown by Mr. Krelle in this section was the same as that which was awarded the first place in Section 1. The total number

of points gained by the crop is 93, and by the fallow (judged in 1920) 99, giving a grand total of 192.

Second place goes to Mr. A. D. McGilp, who showed a very fine crop of 120 acres of Federation. This land was ploughed in July, and immediately harrowed and cross-harrowed. It was scarified in September, and harrowed in October, December, and January—each time after rain. It was scarified early in June, and towards the end of the same month was sown by means of the spring-toothed combination drill and harrowed. At the commencement of sowing 80 lbs. of seed per acre were used, but towards the end this was increased to 85 lbs. A dressing of 100 lbs. of super. per acre was applied. The crop was not quite as heavy as that of Mr. Krelle, and contained a few strangers, but it was even, and, with the exception of an occasional "dead-head," free from disease. Very few weeds were present. The points awarded to Mr. McGilp for the crop are equal to those obtained by Mr. Krelle, *i.e.*, 93. In 1920, Mr. McGilp's fallow obtained 94 points, giving a grand total of 187.

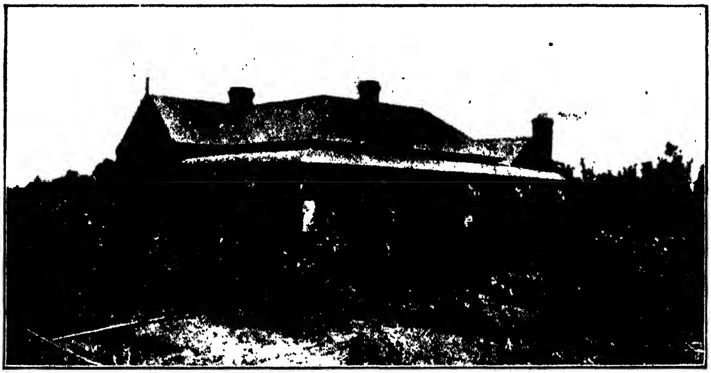
Mr. A. Lutze's New Residence at Coromby.

Next in order come Messrs. A. Lutze and H. A. Niewand, with a total of 178 points each. Mr. Lutze showed a very even crop of 144 acres of Huff's Imperial, a variety which he prefers to Federation. With the exception of a little Federation, the seed was true to type. Most points were lost for weeds, there being a considerable undergrowth of barley grass and mustard, also a fair number of wild oats. All except 30 acres of this crop was grown on summer fallow, ploughed in March to a depth of 4½ inches, and harrowed early in July to break up the clods. In early September 50 acres were reploughed on account of a heavy growth of rubbish, the remainder being scarified and the whole harrowed. Late in October the paddock was scarified again, harrowed in January, and again in March, and scarified towards the end of May. In July, 60 lbs. of seed and 100 lbs. of manure were sown with the combined drill. The crop shown by Mr. Niewand in this section was the same as that reported in Section 1.

Mr. P. C. Schultz's crop comprised 125 acres of Federation and 67 acres of Penny, all grown on summer fallow. The Federation was sown at the rate of 75 lbs. and the Penny at 85 lbs. per acre, with 90

lbs. of manure. The seeding was done with the combined drill (set tyne) about the middle of July. The Penny was very true to type, and promised to yield well, but, unfortunately, it has gone down in parts, particularly in the hollows. Mr. Schultz prefers Penny to Federation, and has obtained some good yields from that variety. In the experimental plots conducted by Mr. G. Coutts, at Warracknabeal, for the Department of Agriculture, Penny has, over a period of four years, averaged 1½ bushels per acre better than Federation. However, it is disliked by many farmers owing to its tendency to lodge.

Messrs. R. J. Cowan and F. Burton both showed very creditable crops of Federation, but they were not as heavy as those of the other competitors in this section.

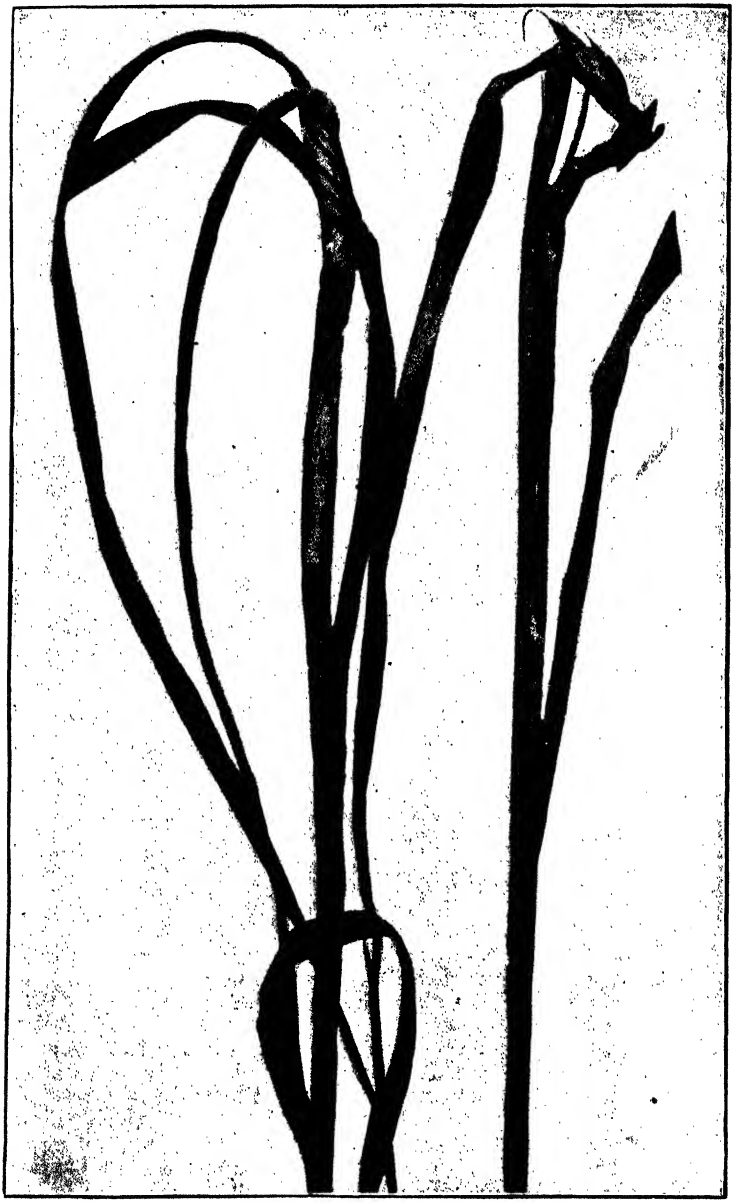


Messrs. Boschen Bros.' Homestead.

SECTION 3.—FOR BEST FALLOWED LAND—NOT LESS THAN 100 ACRES.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
Barry and Lightbody ..	25	22	22	24	93
T. C. Leslie	25	22	24	20	91
H. A. Niewand	25	21	22	22	90
W. Schodde	25	20	23	22	90
J. Ruwolt	25	21	21	22	89
Executors of late Duncan McGilp	25	21	21	20	87

The winning fallow was that of Messrs. Barry and Lightbody. It consisted of a 100-acre paddock, mainly black soil. As in all other fallows seen, the moisture content was high. In fact, owing to the heavy rains this season the value of the moisture test has been entirely eliminated, and it was possible to separate the fallows only with regard to the character of the mulch, the efficiency of the cultivation, and the presence or absence of weeds. Messrs. Barry and Lightbody's fallow had a fine, mellow mulch, about 2½ inches deep, but slightly set down by the recent rains. The consolidation of the underlayers was all that could be desired. This land was summer fallowed with the scarifier in April to a depth of 2½ inches. In July it



Flag Smut of Wheat.

[From the Smuts of Australia, by D. McAlpine.

was skim-ploughed 3 inches deep, harrowed twice in September, scarified towards the end of September, again early in October, and again late in October. Sheep were put on whenever any rubbish appeared.

Mr. T. C. Leslie's fallow, which was awarded second place, had a fair mulch and only a very few weeds, but in some parts the desired consolidation had not been effected.

The remaining fallows lost points for defective mulches, insufficient consolidation, and the presence of barley grass and other weeds.

SECTION 4.—FOR BEST CROP GROWN ON FALLOW LAND—THE FALLOW TO BE JUDGED IN 1921, AND THE CROP GROWN ON THE FALLOW IN 1922.

In this section only two entries were received—those of Messrs. Barry and Lightbody and H. A. Niewand. The fallows shown were the same as exhibited by these competitors in Section 3, and the points awarded are identical with those given under that section.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible points	25	25	25	25	100
Barry and Lightbody ..	25	22	22	24	93
H. A. Niewand	25	21	22	22	90

SOME NOTES ON THE COMPETITION.

(*a*) SUMMER FALLOW.

An outstanding feature of the competition this year is the fact that of, approximately, 1,300 acres of crop entered about 900 acres were grown on summer fallow, while of the fallows judged all were summer fallow. It must be admitted that in most of the crops where portion was summer fallow and portion winter fallow, very little difference could be seen. This is, no doubt, due to the exceptionally favorable season experienced, but most of the competitors were of the opinion that, in an average year, the summer fallow yields at least one and a half bags more than winter fallow. Probably the most suitable procedure is to do portion of the fallowing during February, March, or April, and the remainder after seeding is completed. This allows a more even distribution of the work of the farm, and does away with the rush entailed in getting the whole area fallowed in winter. Another important advantage of summer fallow is that it greatly facilitates the cleaning of the land. Longer time is given for the germination of rubbish, and, consequently, there are more opportunities for getting rid of it.

(*b*) FLAG SMUT.

Very little "take-all" was noticed this season, but "flag smut" was present to a slight extent in most of the crops. This is a disease somewhat similar in its effect to "take-all." It attacks the flag, causing it to curl up and become twisted and distorted, while the ear is seldom formed. At first the leaves shew long, grey streaks running parallel to the veins. Later these streaks burst, exposing the black powdery spores, the appearance of the disease at this stage having earned for it the name of "black rust." It is capable of causing considerable loss, and where it is noticed in a district preventive measures should be taken. The main source of infection is

the diseased leaves, which lie in the ground till the succeeding crop is sown, and thus the young seedlings become infected. Since this is so, pickling the seed has no effect on the disease. The most effective remedies are: (1) a good stubble burn; (2) early fallowing with thorough working of the fallow; and (3) the inclusion in the cropping system of oats, a crop not affected by the disease. Since the spores can pass unharmed through the digestive organs of the horse, diseased hay should not be used for chaff.

Rate of Seeding and Manure.

The amount of seed per acre sown by the competitors varied from 60 to 87 lbs. This is a very considerable variation, and it is obvious that there must be some particular rate of seeding more profitable than any other. As no tests have been carried out in the Minyip district, it is not possible to say with any degree of certainty the rate of seeding most suitable, but at Longerenong College, where the conditions are somewhat similar, a seeding of 75 lbs. per acre has given the best results. Somewhat the same variation exists with regard to the amount of manure applied. The dressing favoured by the competitors varied from 60 to 120 lbs. per acre, the heavier dressing being used by Mr. Krelle on the winning crop.

In conclusion, I desire to thank the members of the Society for their hospitality, and the secretary, Mr. J. D. Heckle, for his valuable assistance and co-operation during the judging of the competition.

TOMATO WILT EXPERIMENTS.

Summary of the Bendigo Experiments for the Prevention of "Spotted Wilt."

SEED.

Plots were planted with different varieties, mainly the commercial ones grown in the district. Old seed was used in some of the plots, and in others new seed. Some of the seed was seven years old, consequently it was grown long before the "wilt" appeared in the State. Seed from affected plants was sown in order that results might be compared with those from seed of healthy plants. Some seed was pickled with corrosive sublimate and some with formalin, so that results from each might be compared and both with results from non-pickled seed.

SPRAYING TESTS.

The following sprays and dusting powders were used:—

Bordeaux Mixture (summer and winter strengths).
Copper Soda (summer and winter strengths).
Lime sulphur (summer and winter strengths).
Corrosive Sublimate.
Formalin.
Chlorazone.
Arresto, dusted on.
Sulphur, dusted on.

Two rows of plants and two check rows were apportioned to each test, and the spraying was carried out when the plants were well established and staked.

PLANTING.

Plots were planted in new ground, that is, where tomatoes had never been grown, and also in old ground. The varieties, cultivation, manuring, sterilizing, and spraying were similar in both the new and old ground.

LIMING AND MANURING.

Nitrogenous manures	Stable manure. Dried blood. Nitrate of soda. Bonedust.
Phosphoric acid	Superphosphate. Bonedust.
Lime	Carbonate. Sulphate.

The manures and lime were applied in varying weights on the different plots.

STERILIZING THE SOIL.

Two sections on each plot were sterilized by live steam to ascertain whether soil organisms had any bearing on the disease.

STAKING AND PRUNING.

For spraying purposes staking is essential. Comparisons were made of the yields from pruned and unpruned plants, and from the staked and those not staked.

MARKETING.

The cost of marketing remains the same whatever the price, and it is only profitable to produce good fruit early in the season and by so doing catch the market when prices are at their maximum.

NOTES ON THE EXPERIMENTS.

There was practically no disease in the State last season, so the information gained on the subject of "spotted wilt" was of little or no value.

No conclusions could be drawn from the experiments with the old and new seed or from its treatment. Pickled seed took much longer to germinate, but it rapidly made up the leeway and was more vigorous in growth in both the hot and cold frames.

The "wilt" being practically non-existent, no knowledge was gained regarding the effects of the various sprays on the disease.

Not much information was gained from the manurial tests—these to be of use would require to be carried on for a series of years. It was, however, shown that lime and superphosphate were beneficial in combination. The same may be said of gypsum and superphosphate. On new ground, as was expected, the effects of manuring were more marked than on the old ground. No actual benefit was noticed by the combinations of sulphate of potash and superphosphate or sulphate of potash and bonedust.

The staked plants gave larger yields than the unstaked; this was more noticeable on the new ground.

On the plots sterilized by steam the plants were stronger, healthier, and cropped better. It is a well-known fact that sterilization kills many of the lowly organisms that prey on soil bacteria, and gives the bacteria a chance to flourish more abundantly and produce more plant food.

The number of cases sold amounted to 511, of these 248 brought on the average 8s. 3d. per case, while 263 cases averaged only 2s. 1d. per case, the net return being £114 18s. 4d.

PRELIMINARY MACERATION.

A NEW WINE-MAKING DEVELOPMENT.

F. de Castella, Government Viticulturist.

In Algeria and other warm countries fringing the Mediterranean, a new wine-making method has recently been evolved which seems likely to prove of great value under Northern Victorian vintage conditions, more particularly in an abnormally warm season. It is dealt with at some length in Professor Fabre's recent work on wine-making in Algeria,* from which much of what follows has been adapted.

The innovation is an amplification or extension of "sulphiting" now so familiar in Australian wineries, and which has so transformed wine-making that in normal seasons, at least, there is no longer any excuse for the making of unsound wine. The new method is, in fact, intermediate between ordinary sulphiting and the interesting *Vinerie* method first proposed by M. Barbet about twelve years ago, which has not as yet been applied on a practical scale in Australia.

Briefly, it consists in sulphiting with three or four times the usual dose of SO_2,† with the result that the start of fermentation is delayed for about three days. During this time the skins macerate in the juice, which dissolves from them the colour and extractive substances (tannin, &c.), characteristic of red wine.

In order to make white wine, maceration is, of course, unnecessary. The must is immediately pressed out from the crushed grapes and heavily sulphited; subsequent treatment being much the same as for red wine.

Even in the case of red wine, however, fermentation does not take place in contact with the skins. The vat is filled with crushed and stemmed grapes, sulphited with about four times the usual dose of SO_2 and allowed to remain for three days before pressing, which is

* *Procédés Modernes de Vinification en Algérie et dans les Pays Chauds*, by J Henri Fabre, Professor of Chemistry and Oenology at Maison-Carrée Agricultural College (Algeria). Published in 1920. In the introduction, by Professor Lagatu, of Montpellier, the new method is commended on account of its suitability to the Algerian climate, similar in many respects to that of northern Victoria.

† SO_2 is a convenient abbreviation for sulphurous acid (anhydrous) or more correctly, sulphur dioxide, of which it is the chemical formula. It must not be confounded with commercial sulphurous acid, known to the trade as S/ous, which is a solution of sulphur dioxide in water. The maximum strength of this solution at 68°F is 11 5% of SO_2, but that supplied by the trade usually contains about 5%. It soon loses strength, owing to evaporation and oxidation.

When sulphur is burnt in air one part by weight combines with an equal weight of atmospheric oxygen to form two parts of SO_2—which is a gas.

One ounce of SO_2 is provided by :—

(a) The combustion of ½ ounce of sulphur

(b) One ounce by weight of sulphur dioxide gas, liquified under pressure ;

(c) 2 ounces of so called Bisulphite of Potash (really anhydro-bisulphite $K_2S_2O_5$) or soda. Though these salts when pure and freshly prepared contain rather more than 50% SO_2 trade parcels may be looked upon as containing half their weight of SO_2 ,

(d) 5 ounces Bisulphite of Soda solution @ 20% ;

(e) 20 ounces commercial Sulphurous Acid (S/ous) @ 5%.

carried out prior to, or at the very commencement of, fermentation. The chief departure from the usual method of making red wine lies in the fact that *the extraction of colour, &c., takes place before fermentation, and not during this process.* After three days' maceration the pressed juice is fermented apart from the skins; as the SO_2 gradually disappears, mechanically removed by the ascending bubbles of CO_2* produced by fermentation, the colour, which was temporarily bleached, reappears, and the resulting wine has nearly as much colour and body as that made in the usual way.

It was formerly considered necessary, in order to make a red wine, that fermentation should take place in contact with the skins; the resulting alcohol was held to be the indispensable solvent of the colouring matter. It has since been proved that alcohol is by no means necessary as a colour solvent. The colouring matter contained in the skin of red grapes is, in fact, quite soluble in water. Time alone is needed for solution to take place—in other words, maceration. The very SO_2 which postpones fermentation, assists in the extraction, as it has a considerable solvent action on colour and extractive matter. Though the colour seems at first sight to be bleached and changed, it reappears in all its brilliancy on the disappearance of the SO_2.

Evolution of the New Method.

In order to make this intelligible, we must go back a few years and briefly review the four most important wine-making methods which have, from time to time, been suggested. These are, in chronological order, heat extraction, sulphiting, Barbet's *Vinerie* system, and Semichon's method.

Heat Extraction.

Rosenstiehl,† experimenting in 1897 on the extraction of colour, &c., from grapes by heat, showed that by allowing the marc to macerate in grape juice heated to between 113° F. and 131° F., the red colouring matter was rapidly extracted, thus proving—

"That the colouring matter is dissolved during fermentation, not thanks to the alcohol produced, as was thought and taught, but because the obstacles to its solution disappear under the action of heat or of fermentation. The envelopes which hitherto protected the colouring matter from the solvent action of the juice are broken down during maceration."

Thus was evolved a new method of wine-making by heating, either the must or the crushed grapes, concerning which many articles were contributed to the French viticultural press towards the close of last and the beginning of this century, by such authorities as Rosenstiehl, Kayser, Barba, Semichon, Martinand, &c.

Professor Bioletti, of the University of California, visited some of the chief vine-growing regions of Europe and Algeria in 1904, under the auspices of the University. On his return to California, he published a bulletin‡ in which he summarized the results of his observations. He

* CO_2 is the chemical formula of carbonic acid, the gas liberated during fermentation. According to Lindet, during fermentation, 100 grammes of grape sugar are transformed into—

Carbonic Acid Gas (CO_2)	46·67	grammes
Alcohol	48·46	,,
Glycerine	3.23	,,
Succinic Acid	0·61	,,
Yeast, &c.	1·03	,,
	100·00	,,

† *Revue de Viticulture.* 19th June, 1897.

‡ Bulletin No. 167 of the University of California publications, "Manufacture of Dry Wines in Hot Countries."

was much impressed with the new method, which he considered to be the most promising direction in which to look for a means of making good dry wine so as to overcome difficulties owing to climate, &c., of the great central plain of California.

In 1906 he issued Bulletin 177 on "A new method of making dry red wine," giving full practical details of the heat extraction method, including separation of the must, heating of same to 140° to 150° F., maceration on the skins in the extraction vat at about 125° F. for from four to eight hours, pressing, cooling of the pressed juice to 80° F., and its immediate fermentation with a pure yeast apart from the skin. The new process, though successful, does not seem to have altogether fulfilled expectations. In Bulletin 198, issued in 1908, in the portion devoted to improved methods of wine-making, he writes—

"Heat extraction.—The new method of wine-making described in Bulletin 177 has been given a fair trial, and the results on the whole have been satisfactory. It has been demonstrated that a good wholesome wine of remarkable keeping qualities can be made by this means. The colour is deeper and more stable than that of wines made in the usual way, and the control of temperature is much facilitated. In general, it gives greater certainty of obtaining a good and absolutely sound wine than the older methods. Whether the quality of the wine is equal to that of the best wine made by the older methods is still in doubt. It should be remembered, however, that this method is still new, and imperfectly understood. Further tests are needed to demonstrate whether it is capable of producing wines of the highest quality."

"The method has been taken up in practice in a limited way, and so far has given satisfaction. . . ."

"The wines made in this way have shown a tendency to acquire a "Port" taste, which is undesirable in dry wine. This taste, however, may be due to the character of the grapes used more than to the method. None of the red grapes grown in quantity in the San Joaquin Valley are suitable for the production of dry red wine in that region. Any grape which, like the Zinfandel, dries up into raisins on the vine, or easily acquires a "rancio" taste, like Mission or Grenache, is unsuited for the making of dry wine in a hot district."

Though many thousands of gallons of wine were thus made in France, the system did not become general, no doubt owing to the development of the now deservedly popular sulphiting method which came into use about this time.

Sulphiting.

Or, as M. Fabre calls it, "The classic process of wine-making," is now so well known as to scarcely need description. Nevertheless, for the benefit of those not familiar with wine-making, M. Fabre's concise summary of sulphiting as now practised in Algeria may be translated, as follows:

(*a*) "Sulphiting at the rate of 20 grammes of sulphur dioxide (SO_2) per hectolitre, added in two portions of 10 grammes each, one when the grapes are crushed, the other during the course of fermentation."†

(*b*) Contact of the must with the stemmed grapes during fermentation, which lasts, as a rule, three days.

(*c*) Immersion of the "head" (*chapeau*) by rammings given morning and evening.

(*d*) Racking the vat during the course of the third day of fermentation whilst the gravity is still from 1.025 to 1.029 (3.4° to 4° Baumé).

† 20 grammes SO_2 per hectolitre is equivalent to 6.36 ounces bisulphite of potash (50 % SO_2) per 100 gallons.

It will be observed that the total dose of SO_2 recommended by M. Fabre (equivalent to 6.4 oz. of 50 per cent. bisulphite per 100 gallons) is higher than that recommended in articles which have appeared in this *Journal.**

Dupont and Ventre, and particularly Gimel, recommended the addition of the whole dose of about 4 oz. bisulphite per 100 gallons at the crushing of the grapes.

The standard Algerian method consists in adding a dose nearly equal to that recommended by earlier writers when crushing, and to repeat this dose during the course of fermentation, thus using it as a "chemical cooler." With these differences, and a rather shorter sojourn in the vat, sulphiting as practised in Algeria to-day does not differ from the method recommended by Dupont and Ventre fifteen years ago.

The "Vinerie" System. (*Barbet's*).

This may be regarded as sulphiting carried to its logical conclusion.

As soon as the grapes are vintaged and crushed, the juice is sterilized with a sufficient dose of SO_2 to render fermentation impossible. It can then be stored until such a time as suits the wine-maker and fermented at leisure, after the removal of the SO_2 by the operation known as de-sulphiting, under most suitable conditions as regards temperature and cellar care.

This system would naturally lead to the industrialization of wine-making, and put the industry on a similar footing to brewing. It would do away with the hurry and stress which too often interfere with the smooth working of fermentation—always a rather delicate process—during the strenuous vintage season.

The vintage plant is reduced to a sufficiency of cement vats to contain the whole of the juice, some macerating vats for making red wine, and a crushing and pressing plant to extract the juice. The fermentation plant can be on a much more modest scale, as its work continues over a period of many months instead of a few weeks.

At vintage, the grapes are crushed and immediately sterilized by the addition of a dose of SO_2 sufficient to prevent any trace of fermentation, usually at the rate of 125 to 150 grammes of SO_2 per hectolitre of must, equivalent to 40 to 48 oz. bisulphite of potash per 100 gallons, or about ten times the usual dose when sulphiting.†

In order to make white wine, the grapes are pressed immediately and the juice sulphited as above, and stored to await the fermentation process at a convenient time.

For red wine the grapes are crushed and stemmed, sulphited, and allowed to macerate for three or four days on the skins; they are then pressed, and the juice stored until fermented, just as in the case of white wine. During the maceration process the colour and tannin are dissolved from the skins, as explained on p. 37, their extraction is

* See article on Sulphiting in *Journal* for January, 1911 (a reprint of which is obtainable on application). In this article it was stated that, according to Dupont and Ventre, the most useful dose was from 10 to 15 grms. per hectolitre of SO_2, equivalent to 1·6 to 2·4 oz. SO_2 per 100 gallons, or practically double this dose of potash bisulphite, since this salt usually contains half its weight of SO_2, say 3·2 to 4·8 oz. of bisulphite.

† With such heavy doses the use of bisulphites is undesirable. It is far better to employ sulphur dioxide (SO_2) either produced by the combustion of sulphur or obtainable, compressed to liquid state, in steel cylinders.

greatly facilitated by the high dose of SO_2, the solvent action of which, on these substances, is considerable.

Before fermentation is possible, it is necessary to de-sulphite the juice (red or white), or, in other words, to remove the SO_2 which has prevented fermentation. This is done by passing it through a de-sulphiting apparatus, of which there are several distinct types. One of the most ingenious is that of Barbet, constructed on similar lines to the rectifying column of a still. The must passes through this column at reduced pressure (partial vacuum), and at a temperature of about 70° C. (158° F.). There are several other types of de-sulphiting machines, notably those of M. Bonnard (of Alger), and Sicard (of Cette (South France). In these, the removal of the SO_2 is effected by evaporation, in shallow depth, at a temperature of 122° F. to 140° F.

In addition to fermentation without stress or hurry, the Vinerie method presents several other advantages. During storage of the sulphited musts, sedimentation takes place, removing dirt and undesirable pectic substances. The must, when ready for fermentation, is thoroughly sterile, and lends itself admirably to the use of cultivated yeasts. The resulting wine has thus every chance of being not only absolutely sound and free from disease, but very clean, delicate, and of excellent condition and keeping quality.

Notwithstanding these obvious advantages, the method has not displaced the usual or classic method of wine-making, as was expected at its introduction in Algeria, M. Fabre states that the Misserghin Vinerie, established near Oran, Algeria, in 1910, only operated for a few months. Another vinerie seems to have been built last year at Sidi-Bel-Abbès (Algeria), and some similar establishments are working in Greece and in Italy.

The chief reason for the slow progress of the new method seems to be the high cost of the plant and difficulty in the proper working of the somewhat complex de-sulphiting apparatus.

This very short description of the Vinerie system is necessary in order to properly explain the newer method which forms the subject of the present article.

Semichon's Method.

In 1909, M. L. Semichon proposed to radically transform the making of red wine by a method differing considerably from that of Rosenstiehl and also from that of Barbet, by the postponement of maceration until after fermentation.

As soon as the grapes are crushed the juice is separated (mainly by draining) and fermented apart from the skins, as a white or slightly coloured wine, which is subsequently macerated (after fermentation) on freshly crushed and drained skins from which it dissolves colour and other extractive substances. Maceration is not, however, carried out on the grapes from which the wine was originally extracted, but on the drained skins from a later crushing.

Semichon, in fact, recommends to commence the vintage with white or other light-coloured grapes, and to postpone the vintaging of the red grapes, on which the white wine, first made, will macerate, until fermentation is sufficiently advanced (four or five days). In other

words, the wine does not macerate on its own skins but on those of grapes vintaged a few days later.

It is not here necessary to go into the details of the process and the working of the different series of vats which are divided into two main groups, viz., maceration (and drainage) batteries, and fermentation batteries.

From the latter the wine flows continuously through the former until the colour, &c., has been sufficiently extracted, when the skins are either pressed, or separated from the wine they retain by diffusion.

Though somewhat complicated, the manipulations, once properly under way, should work smoothly enough.

Semichon claimed several advantages for his method over Barbet's *Vineries,* one of the principal being the more complete extraction of the flavouring substances of the grape, several of which are, in his opinion, mainly dissolved by the alcohol produced during fermentation. A lengthy and interesting controversy ensued between these two authorities in the columns of *La Revue de Viticulture,* in 1909.

Notwithstanding the high standing of its inventor in œnological science, Semichon's method does not seem to have been applied on a large scale. It is not even mentioned in recent works on wine-making.

Maceration and Fermentation Not Necessarily Simultaneous.

From the foregoing it will be seen that the making of red wine comprises two quite distinct processes, viz., fermentation, or the conversion of the grape sugar into alcohol; and maceration, or the dissolving from the skins, of the colour, tannin, and some other substances to which red wine owes its peculiar character.

Contrary to what is often thought, these two processes are quite distinct, and are not necessarily connected in any way.

Maceration may take place before, during, or after fermentation.

In the time-honoured way of making red wine, the two are simultaneous—nor has ordinary sulphiting altered this order of things.

In Barbet's *Vineries* there is, however, a very radical departure, maceration taking place before fermentation, which is held over until a convenient season, which may be weeks, or even months, later. The new Algerian method, likewise, makes maceration precede fermentation, but by the short period of three days only.

In Semichon's ingenious method, on the contrary, fermentation precedes maceration, the wine being fermented apart from the skins just as white wine is, and in it, the skins (usually a fresh lot) are macerated later on.

Preliminary Maceration.

This new method is really a modification of Barbet's *Vineries,* by considerably reducing the dose of SO_2 and completely eliminating the desulphiting apparatus. Instead of ten times the usual dose of SO_2 as needed by the Vinerie system, four times the normal dose suffices in the case of preliminary maceration. According to M. Fabre:—

"Empirically, sometimes perhaps accidentally, wine-makers in warm Mediterranean countries have found that it is possible to obtain most of the advantages

claimed by M. Barbet, in favour of his *Vineries*, not by using 100 grammes or more of SO_2 per hectolitre (which stops fermentation too effectually), but by using quantities very superior to those usually laid down in classic wine-making (10 to 20 grammes)."

. . . "The new process consists in treating the crushed grapes with a dose of SO_2 sufficient to stop fermentation for about three days."

"This check permits the realization of the maceration phenomena recommended by M. Barbet, and which consist in the dissolving of the colouring matter of the skins and of various extractive principles, by the musts destined to become red wines." . . .

"As a rule, in our tests, with not more than 40 grammes of SO_2 per hectolitre (12.8 oz. bisulphite per 100 gallons), fermentation was only able to establish itself in the *maceration vats*, towards the third day, making a timid beginning in the upper part of the liquid. We then rack the first run, which is still cool (in reality at the cellar temperature, which is about 77° F.), and immediately press the marc."

"The juice from the press, which is already commencing to ferment, is mixed with the first run, and pumped into the fermentation *amphoræ* (cement vats), where the transformation takes place with great security; no alarming rise of temperature occurs, and as there is no "head" (*chapeau*) of marc, there is no need to pump over the vat (from bottom to top)."

It is recommended, not to allow the fermentation to complete itself in the *fermentation amphoræ,* or vats, which would take several days (the original gravity of the must was about 12° Baumé), but to pump them into finishing vats (*amphores d'achèvement*), where the fermentation concludes in perfect order. M. Fabre's experiments were certainly on a very large scale. In the co-operative cellars of Gouraya and of Dupleix he operated on several hundred thousand gallons. He sums up the advantages and defects of the new method as follows:—

Advantages (much the same as those claimed by M. Barbet for his *Vineries*):—

1. Purification of the musts operated on, from a micro-organism stand-point.
2. The musts having time to cool during the three days' maceration, fermentation starts at a relatively low temperature—approximately that of the interior of the cellar (about 77° F.).
3. There being no "head" in the fermenting vat, there is no risk of acetification, nor is there any need to pump from bottom to top during fermentation.
4. This method requires no special plant. It is, in fact, more easy to conduct than the *classic method,* particularly in hot weather.

Drawbacks:—

1. The wines are appreciably less deeply coloured than those obtained by the classic method.*
2. They contain a little less dry extract and body.
3. They must be racked several times to facilitate the liberation of SO_2 which they contain.

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* It is true that Barbet claims increased colour for his *vineris* wines, owing to the solvent action of the heavy dose of SO_2. M. Fabre does not contradict this, and merely notes that with the dose he used the colour was less deep. He points out that this could be obviated by allowing the fermentation, just about to start, to continue for a few hours before racking and pressing, though this would constitute a partial return to the "classic method"—it could no longer be strictly termed preliminary maceration.

M. Fabre submitted samples of wines made by the new and the old methods to a committee of expert wine-tasters, who reported as follows:—

1. The samples tasted are excellent; but they would have gained in colour and flavour had their total acidity been slightly increased.
2. The wines obtained by the classic method seem more complete and richer in colour, but show less refinement (*moins fins*) than the wine made by preliminary maceration.
3. From a commercial stand-point, the wines made by the classic method are more in current demand, because they show more colour and body (qualities sought by the trade for blending wines).
4. On account of its refined character, the wine made by preliminary maceration is worthy of being reserved for sale to *la clientèle bourgeoise*.* According to M. Lung (one of the tasting committee), "This class of wine is in strong demand by a well-informed class of customers, whose numbers are bound to increase."

Continuous Fermentation.

The new method lends itself to the practical application, in wine-making, of the process, well known in industrial distilleries, under the name of continuous fermentation.

This would consist in replenishing the fermenting vat, either continuously or else twice a day, with cold sulphited must; a corresponding bulk of the partially fermented wine having been previously withdrawn, the specific gravity of which would be about 1.020 (nearly 3° Baumé—2.8° B. to be accurate), the portions thus withdrawn completing their fermentation in special "finishing" vats.

Though M. Fabre does not consider this procedure indispensable, he agrees with M. Barbet, who recommends its application as being most favorable to temperature control in the fermenting vat. He quotes a letter, dated 26th December, 1919, from a Greek correspondent (Société Hellénique de Vins et Spiritueux) who applied the method during several vintages, and who states: "The de-sulphiting of musts containing up to 1 gramme of sulphurous acid (SO_2) per litre† does not necessitate the use of special apparatus provided starters (*Pieds de Cuve*) are moderately and continuously replenished (with cold sulphited must) in such a way that the fermenting mass remains at the constant gravity of 5° to 6° Baumé."

In the absence of practical working details, the following outline will give an idea of how the process might be applied to, say, a 1,000-gallon vat.

The vat might commence with a starter of 400 gallons of moderately sulphited must (2 oz. SO_2 per 100 gallons) of an original gravity when crushed of 12° Baumé. As soon as the gravity has reduced by fermentation to 5° B., enough of the heavily sulphited cold must (also at 12° B.) is run in, to raise the gravity to 6° B. This would need the

* The term *Clientèle bourgeoise* is not easy to concisely translate. Middle-class customers is perhaps the nearest English equivalent. This class, in France at any rate, appreciates quality. It wants its *vin ordinaire* to be of rather higher grade than would satisfy the ordinary French labourer.

† This would mean 16 oz. SO_2 per 100 gallons, practically equivalent to 32 oz. (of 50% SO_2) bisulphite per 100 gallons.

addition of about one-sixth of the bulk in the vat, or 66 gallons of cold sulphited must.

After a few hours, when the gravity has again fallen to 5° B., a fresh addition of cold sulphited must is made, and so on until the vat is full.

After this, the process becomes continuous; every few hours, when the gravity of the vat registers 5°, one-sixth of its contents is withdrawn and replaced by an equal bulk of cold, sulphited must, the portions withdrawn being pumped into a finishing vat or into casks to complete fermentation slowly and without danger of an alarming rise in temperature.

The exact gravity at which withdrawals can most advantageously be made, their bulk and their frequency, would, no doubt, depend a good deal on the class of wine turned out. These would, in all probability, be different in the case of a wine of *Vin ordinaire* type, containing 16 or 17 per cent. proof spirit, to what they would be for an "export" wine containing 24 per cent. proof.

It is evident that this process is really applicable only in wineries turning out large quantities of wine of perfectly even type, as is the usual rule in Algeria. It is much less suited to Australian conditions, where many quite distinct wines are usually produced in the same cellar.

* * * * * * *

The foregoing is a brief description of the new method of wine-making. It does not seem destined to supersede the method by which the majority of Victorian wines are now made—which is practically the same as the "classic" Algerian method—in ordinary seasons, and more particularly for the making of export wines, in which colour and body are eagerly sought after.

Nevertheless, it presents certain advantages which will render it of inestimable value during an abnormally hot vintage. Practical wine-makers know, only too well, the disastrous effects of a heat wave occurring during vintage, and the large quantities of faulty wines such a visitation may be responsible for.

Heat waves are most likely to occur early in the vintage, since the weather becomes cooler later on. This early occurrence is particularly undesirable since it may lead to bacterial contamination of the winery and loss of quality in wines made later, when conditions have again become normal.

Mishaps of this kind would be altogether avoided by the adoption of the preliminary maceration process, if only during the currency of the heat wave. Though the wines then made might be somewhat light in colour and body, they would at least be sound, and bacterial contamination of the cellar would be obviated.

For the making of light dry table wines more particularly, it also shows great promise. If we ever become a wine-drinking people, as are the Latin countries of Europe, an active demand for light table wines at a reasonable price will surely develop—in other words, the *clientèle bourgeoise* mentioned by M. Lung. For such a trade, owing to the greater delicacy of the wine, the new method should prove of very considerable value.

For these two reasons, principally, the writer considers it his duty to bring this interesting Algerian development under the notice of Victorian wine-makers, in time for the coming vintage.

ARTIFICIAL FERTILIZERS.

List of Fertilizers Registered under the Fertilizers Act for the Year 1922.

By P. Rankin Scott, Chemist for Agriculture.

REGISTRATION OF BRANDS.

The Artificial Fertilizers Act requires that all manufacturers and importers of fertilizers submit for registration on or before the 1st November, in each year, a brand for each fertilizer they intend offering for sale during the following year.

In addition to his full name and place of business, and the figure, trade mark or sign, to be associated with the fertilizer to identify it, each applicant is required to give a statement of the percentage composition of the fertilizer for which registration is desired, in respect of its nitrogen, phosphoric acid, and potash, showing the forms in which they occur, and the retail price of the fertilizer. The term "form" has reference to the combination of the fertilizing constituent with other constituents, the availability of the fertilizer largely depending on the combination of the elements composing it. A fertilizer, according to the Act, is any material containing nitrogen, phosphoric acid, or potash, which has been manufactured, produced or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to the plant.

The list of registered brands that have been accepted is to be found on pages 47-54 of this issue.

TABLE OF UNIT VALUES.

The unit values are calculated each year from the brands of the simple fertilizers registered. These values afford a basis for calculating the commercial values of all fertilizers for the period during which the brands continue in force, serving, also, the buyer by affording a means of comparing the prices of all registered brands. It may be pointed out, however, that in the case of a mixed fertilizer no allowance is made for extra cost of handling and mixing, incurred by the manufacturer. To obtain the commercial value of a fertilizer multiply the percentage of nitrogen, phosphoric acid, or potash, as stated on the label or invoice certificate, by the unit value fixed for the form in which it occurs in the fertilizer, and add together the results.

The following typical examples will explain the method of calculation:—

(1) SUPERPHOSPHATE.

Analysis.			Unit Value. s.	d.		£	s.	d.
Phosphoric Acid, Water Soluble...	17.00%	×	7	0	=	5	19	0
Phosphoric Acid, Citrate Soluble	0.50%	×	6	0	=	0	3	0
Phosphoric Acid, Citrate Insoluble	0.50%	×	1	0	=	0	0	6
Phosphoric Acid—Total ...	18.00%							
Calculated value per ton						£6	2	6

(2) BONEDUST.

	Analysis.
Nitrogen, as bone	3.60%
Phosphoric Acid	18.00%

	Mechanical Condition.
Fine Bone	37.0%
Coarse Bone	63.0%

Nitrogen	... 3.60%	×	37.0%	in fine bone =	1.32%
Nitrogen	... 3.60%	×	63.0%	in coarse bone=	2.28%
Phosphoric Acid	... 18.00%	×	37.0%	in fine bone =	6.66%
Phosphoric Acid	... 18.00%	×	63.0%	in coarse bone=	11.34%

			s.	d.		£	s.	d.
Nitrogen in fine bone ...	1.32%	×	25	0	...	1	13	0
Nitrogen in coarse bone ...	2.28%	×	23	0	...	2	12	6
Phosphoric Acid in fine bone	6.66%	×	6	0	...	1	19	11
Phosphoric Acid in coarse bone	11.34%	×	4	0	...	2	5	4
Calculated value per ton...						£8	10	9

FERTILIZER ACT 1915 (No. 2652).—TABLE OF UNIT VALUES FOR 1922.

	Per unit. £	s.	d.
Nitrogen, as Nitrate ..	1	12	4
„ Ammonia	1	1	0
„ Blood ..	1	7	0
„ Bone and Flesh ..	1	5	0
„ Unspecified	1	5	0
„ in Fine Bone	1	5	0
„ Coarse Bone	1	3	0
Phosphoric Acid, as Water Soluble	0	7	0
„ „ Citrate Soluble	0	6	0
„ „ Citrate Insoluble, in Superphosphates	0	1	0
„ „ „ „ in Nitro-supers ..	0	1	0
„ „ „ „ Basic Phosphates ..	0	1	0
„ „ „ „ Market Garden Manure	0	1	0
„ „ „ „ Complete Manures	0	1	0
„ „ „ „ Super and Bone ..	0	4	0
„ „ „ „ Bone Fertilizers ..	0	4	0
„ „ „ „ Animal Fertilizers	0	4	0
„ „ „ „ Blood and Bone ..	0	4	0
„ „ „ „ Intensely ground Phosphate	0	4	0
„ „ „ „ Roasted and intensely ground Phosphates	0	5	10
„ „ in Fine Bone	0	6	0
„ „ Coarse Bone	0	4	0
Potash	0	10	4

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1922.

Description of Fertilizer.	Brand.	Nitrogen. As Nitrate.	Nitrogen. As Ammonia.	Nitrogen. As Blood.	Nitrogen. As Blood and Bone.	Nitrogen. As Unspecified.	Nitrogen. Total.	Phosphoric Acid. As Water Soluble.	Phosphoric Acid. As Citrate Soluble.	Phosphoric Acid. As Citrate Insoluble.	Phosphoric Acid. Total.	Potash.	Price asked per ton.	Where Obtainable.
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Nitrogen—Readily Soluble.														
Nitrate of Soda ..	Federal	15·50	..	..	..	..	15·50	..	..	..	..	..	25 0 0	The Australian Explosives and Chemical Coy. Ltd., 135 William-street, Melbourne
" " ..	M.L., in diamond ..	15·50	..	..	..	..	15·50	..	..	..	..	..	25 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" " ..	Sickle	15·50	..	..	..	..	15·50	..	..	..	..	..	25 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" " ..	Wischer and Co. Pty. Ltd.	15·50	..	..	..	..	15·50	..	..	..	..	..	25 0 0	Wischer and Co. Pty. Ltd., 153 William-street. Melbourne
Sulphate of Ammonia ..	Federal	..	20·00	..	..	..	20·00	..	..	..	..	..	20 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" " ..	M.L., in diamond ..	..	20·00	..	..	..	20·00	..	..	..	..	..	20 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" " ..	Sickle	..	20·00	..	..	..	20·00	..	..	..	..	..	20 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" " ..	Wischer and Co. Pty. Ltd.	..	20·00	..	..	..	20·00	..	..	..	..	..	20 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
" " ..	M.G. Co.	..	20·59	..	..	..	20·59	..	..	..	..	..	18 0 0	The Metropolitan Gas Co., 196 Flinders-street, Melbourne
" " ..	B.G. Co.	..	20·90	..	..	..	20·90	..	..	..	..	..	18 0 0	The Ballarat Gas Co., Grenville-street, Ballarat
Containing Nitrogen—Moderately Soluble.														
Castor, Meal	Federal	..	..	..	..	4·00	4·00	..	..	..	..	..	5 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
"	M.L., in diamond ..	..	..	..	..	4·00	4·00	..	..	..	..	..	5 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1922—*continued.*

Description of Fertilizer.	Brand	Nitrogen. As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Unspecified.	Total.	Phosphoric Acid. As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.	Potash.	Price asked per ton.	Where Obtainable.
Containing Phosphoric Acid—Difficultly Soluble.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Castor, Meal	Sickle	..	..	..	..	4·00	4·00	..	..	....	..		5 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
"	Wischer and Co. Pty. Ltd.	..	..	..	..	4·00	4·00	..	..	..	..	..	5 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Dried Blood	Rohs, in circle ..	..	..	9 50	..	..	9·50	..	..	..	..	..	14 0 0	P. Rohs Pty. Ltd., Bendigo East
"	Champion ..	..	..	12·00	..	..	12·00	..	..	..	..	..	Not retailed	John Cooke and Co. Pty. Ltd., 534 Collins-street, Melbourne
Blood Manure	M.C.C., in diamond	..	..	8·95	..	..	..	..	..	1·46	1·46	0·65	9 0 0	
Dried Blood	Arch	..	..	10·77	..	..	..	..	..	1·71	1·71	..	12 0 0	The Ballarat and District Co-operative Freezing Co. Ltd., Learmonth-street, Alfredton
"	P., in diamond ..	..	..	9·00	..	..	..	..	..	0·50	0·50	..	15 10 0	H. C. Pannifex, 26 Market-street, Melbourne
Blood Manure	Pan, in diamond ..	..	..	7·00	..	..	..	..	..	0·25	0·25	..	11 11 0	H. C. Pannifex, 26 Market-street, Melbourne
Dried Blood	S.C., over D.B. ..	..	..	10·00	..	..	..	..	..	1·50	1·50	..	14 15 0	Sims, Cooper and Co., Aust., Pty. Ltd., Collins-street, Melbourne
Containing Potash—Readily Soluble.														
Muriate of Potash ..	Federal	..	..	..	..	..	..	..	..	..	..	58·00	30 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" " ..	M.L., in diamond ..	..	..	..	..	..	..	..	..	..	..	58·00	30 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" " ..	Sickle	..	..	..	..	..	..	..	..	..	..	58·00	30 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" " ..	Wischer and Co. Pty. Ltd.	..	..	..	..	..	..	..	..	..	..	58·00	30 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1922—*continued.*

Description of Fertilizer.	Brand.	Nitrogen. As Nitrate.	Nitrogen. As Ammonia.	Nitrogen. As Blood.	Nitrogen. As Blood and Bone.	Nitrogen. As Unspecified.	Nitrogen. Total.	Phosphoric Acid. As Water Soluble.	Phosphoric Acid. As Citrate Soluble.	Phosphoric Acid. As Citrate Insoluble.	Phosphoric Acid. Total.	Potash.	Price asked per ton.	Where Obtainable.
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Phosphoric Acid—Readily Soluble.														
Superphosphate ..	Federal, O.S. ..	..	..	..	..	..	..	17·00	0·50	0·50	18·0	..	6 3 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" ..	M.L., in diamond ..	..	..	..	..	..	..	17·00	0·50	0·50	18·00	..	6 3 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Sickle, Florida ..	..	..	..	..	..	..	17.00	0·50	0·50	18·00	..	6 3 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" ..	Wischer and Co. Pty. Ltd., No. 1	..	..	..	..	..	..	17·00	0·50	0·50	18·00	..	6 3 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Moderately Soluble.														
Basic Phosphate ..	Federal, B.P. ..	..	..	..	..	..	..	..	14·00	3·00	17·00	..	5 12 6	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" ..	M.L., in diamond ..	..	..	..	..	..	..	..	14·00	3·00	17·00	..	5 12 6	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Sickle	..	..	..	..	..	..	..	14·00	3·00	17·00	..	5 12 6	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" ..	Wischer and Co. Pty. Ltd.	..	..	..	..	..	..	..	14·00	3·00	17·00	..	5 12 6	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Difficultly Soluble.														
Ground Phosphate ..	Federal, G.P. ..	..	..	..	..	..	..	..	..	36·50	36·50	..	6 0 0	The Australian Expolsives and Chemical Co. Ltd., 135 William-street, Melbourne
" ..	M.L., in diamond, 80 per cent.	..	.	..	..	..	..	..	..	36·50	36·50	..	6 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little street, Melbourne
" ..	M.L., in diamond, 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	5 0 0	" " " "
" ..	M.L., in diamond, 50 per cent.	..	..	..	..	..	..	..	..	23·00	23·00	..	4 7 6	" " " "

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1922—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Containing Phosphoric Acid—Difficultly Soluble— continued.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Ground Phosphate ..	Sickle, 80 per cent.	..	..	..	..	..	..	..	..	36·50	36·50	..	6 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" ..	Sickle, 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	5 0 0	" " " "
" ..	Sickle, 50 per cent.	..	..	..	..	..	..	..	..	23·00	23·00	..	4 7 6	" " " "
" ..	Wischer and Co. Pty. Ltd., 80 per cent.	..	..	..	..	..	..	..	..	36·50	36·50	..	6 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
" ..	Wischer and Co. Pty. Ltd., 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	5 0 0	" " "
" ..	Wischer and Co. Pty. Ltd., 50 per cent.	..	..	..	..	..	..	..	..	23·00	23·00	..	4 7 6	" " "
" ..	Victoria—Roasted and intensely ground	..	..	..	..	..	..	..	3·00	12·00	15·00	..	4 8 6	The Phosphate Co-operative Co. of Australia Ltd., 440 Little Collins-street, Melbourne
" ..	Victoria—No. 3, intensely ground	..	..	..	..	..	..	..	..	14·00	14·00	..	2 16 0	" " "
" ..	Victoria — No. 4, coarsely ground	..	..	..	..	..	..	..	..	11·00	11·00	..	2 5 0	" " "
" ..	Marion, 60 per cent.	..	..	..	..	..	..	..	..	27·50	27·50	..	5 10 0	Arthur H. Hasell, 17 Queen-street, Melbourne
Containing Nitrogen and Phosphoric Acid—Readily Soluble.														
Nitro-Super	Federal, N.S. ..	..	1.50	..	0.50	..	2.00	13.18	0.38	1.71	15.27	..	8 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
"	M.L., in diamond ..	..	1.50	..	0.50	..	2.00	13.00	0.38	1.37	14.75	..	8 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
"	Sickle	..	1.50	..	0.50	..	2.00	13.00	0.39	1.61	15.00	..	8 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
.. ..	Wischer and Co. Pty. Ltd.	..	1.50	..	0.50	..	2.00	13.00	0.39	1.61	15.00	..	8 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1922—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Containing Nitrogen and Phosphoric Acid—Readily Soluble—continued.		%	%	%	%	%	%	%	%	%	%		£ s. d.	
Nitro-Super	Federal, T.D. ..	1.55	..	..	..	..	1.55	15.30	0.45	0.45	16.20	..	7 10 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
"	M.L., in diamond, No. 2	1.55	..	..	..	..	1.55	15.30	0.45	0.45	16.20	..	7 10 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
"	Sickle, T.D. ..	1.55	..	..	..	..	1.55	15.30	0.45	0.45	16.20	..	7 10 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
Top dressing Manure ..	Wischer and Co. Pty. Ltd.	1.55	..	..	..	..	1.55	15.30	0.45	0.45	16.20	..	7 10 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Moderately Soluble.														
Super and Bone ..	Federal, B.S. ..	..	..	..	0.75	..	0.75	12.75	1.13	3.62	17.50	..	7 7 6	The Australain Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" ..	M.L., in diamond ..	..	..	..	0.75	..	0.75	12.75	1.38	3.37	17.50	..	7 7 6	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Sickle	..	..	..	0.75	..	0.75	12.75	1.37	3.38	17.50	..	7 7 6	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" ..	Wischer and Co. Pty. Ltd.	..	..	..	0.75	..	0.75	12.75	1.37	3.38	17.50	..	7 7 6	Wischart and Co. Pty. Ltd., 153 William-street, Melbourne
Bonedust and Superphosphate, mixed	Rohs, in circle ..	..	..	..	1.50	..	1.50	8.50	5.25	4.25	18.00	..	9 0 0	P. Rohs Pty. Ltd., Bridge-street, Bendigo
Blood, Bone and Super., mixed	Rohs, in circle ..	..	..	..	4.00	..	4.00	5.50	6.25	2.25	14.00	..	10 10 0	" " "
Bone and Superphosphate	Gardiner's.. ..	..	..	..	1.39	..	1.39	3.20	5.80	8.00	17.00	..	8 12 6	George Gardiner and Co. Pty. Ltd., Marshall, Geelong
" " ..	Elsworth's Fertilizer	..	..	..	3.00	..	3.00	1.50	4.00	9.50	15.00	..	8 10 0	William Roberts Elsworth, corner of York and Joseph streets, Ballarat
" " ..	Elsworth's Bone Fertilizer and Super.	..	..	..	1.50	..	1.50	9.00	2.50	5.00	16.50	..	7 12 6	" " "

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1922—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Unspecified.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
Containing Nitrogen and Phosphoric Acid—Moderately Soluble—continued.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Bone and Blood ..	Arch	..	..	..	5.00	..	5.00	..	3.50	9.00	12.50	..	9 0 0	Ballarat and District Co-operative Freezing Co. Ltd., Learmonth-street, Alfredton, Ballarat
Animal Fertilizer ..	Champion ..	..	..	..	6.00	..	6.00	..	7.50	4.50	12.00	..	Not retailed	John Cooke and Co. Pty. Ltd., 534 Collins-street, Melbourne
Blood and Bonedust ..	Rohs, in circle ..	..	..	..	6.00	..	6.00	..	3.00	6.00	9.00	..	12 10 0	P. Rohs Pty. Ltd., Bridge-street, Bendigo
Blood and Bone ..	S.C. over B.B. ..	..	..	..	5.50	..	5.50	..	6.00	11.00	17.00	..	12 0 0	Sims, Cooper and Co. (Aust.), Pty. Ltd., The Olderfleet, Collins-street, Melbourne
Animal Fertilizer ..	Fertbone, in circle ..	..	..	..	4.00	..	4.00	..	2.00	8.00	10.00	..	12 12 6	H. C. Pannifex, 26 Market-street, Melbourne
" " ..	H.C.P., in diamond ..	..	..	..	5.00	..	5.00	..	4.75	5.25	10.00	..	12 17 6	"
" " ..	Gardiner's Special Magic	..	..	..	5.00	..	5.00	..	3.00	10.00	13.00	..	19 0 0	George Gardiner and Co. Pty. Ltd., Marshall, Geelong
Containing Nitrogen, Phosphoric Acid and Potash—Readily Soluble.														
Market Garden Manure	Federal, M.G. ..	..	1.50	..	0.56	0.90	2.96	9.77	0.29	1.87	11.93	2.17	9 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" " ..	M.L., in diamond ..	..	1.50	..	0.56	0.90	2.96	9.77	0.29	1.87	11.93	2.17	9 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" " ..	Sickle	..	1.50	..	0.56	0.90	2.96	9.77	0.29	1.87	11.93	2.17	9 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" " ..	Wischer and Co. Pty. Ltd.	..	1.50	..	0.56	0.90	2.96	9.77	0.29	1.87	11.93	2.17	9 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
No. 1 Complete Manure ..	Federal	..	1.50	..	..	1.00	2.50	10.20	0.30	0.30	10.80	7.25	11 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652) FOR THE YEAR 1922—*continued.*

Description of Fertilizer.	Brand.	Nitrogen. As Nitrate.	Nitrogen. As Ammonia.	Nitrogen. As Blood.	Nitrogen. As Blood and Bone.	Nitrogen. As Unspecified.	Nitrogen. Total.	Phosphoric Acid. As Water Soluble.	Phosphoric Acid. As Citrate Soluble.	Phosphoric Acid. As Citrate Insoluble.	Phosphoric Acid. Total.	Potash.	Price asked per ton.	Where Obtainable.
Containing Nitrogen, Phosphoric Acid, and Potash—Readily Soluble—contd.		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
No. 1 Complete Manure ..	M.L., in diamond ..	..	1.50	..	..	1.00	2.50	10.20	0.30	0.30	10.80	7.25	11 0 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Sickle	..	1.50	..	..	1.00	2.50	10.20	0.30	0.30	10.90	7.25	11 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	Wischer and Co. Pty. Ltd.	..	1.50	..	..	1.00	2.50	10.20	0.30	0.30	10.80	7.25	11 0 0	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
No. 2 Complete Manure ..	Federal	..	1.00	..	..	1.00	2.00	10.20	0.30	0.30	10.80	4.64	8 17 6	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	M.L., in diamond ..	..	1.00	..	..	1.00	2.00	10.20	0.30	0.30	10.80	4.64	8 17 6	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Sickle	..	1.00	..	..	1.00	2.00	10.20	0.30	0.30	10.80	4.64	8 17 6	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	Wischer and Co. Pty. Ltd.	..	1.00	..	..	1.00	2.00	10.20	0.30	0.30	10.80	4.64	8 17 6	Wischer and Co. Pty. Ltd., 153 William-street, Melbourne
Containing Nitrogen and Phosphoric Acid—Moderately Soluble.														
Bone Fertilizer ..	Samson's	..	..	..	2.00	..	2.00	..	2.00	15.00	17.00	..	8 5 0	George Gardiner and Co. Pty. Ltd., Marshall, Geelong
,, ..	No. 1 Magic ..	..	..	..	2.00	..	2.00	..	2.00	15.00	17.00	..	8 5 0	,, ,, ,,
,, ..	No. 2 Magic ..	..	..	..	1.50	..	1.50	..	1.50	14.50	16.00	..	7 17 6	,, ,, ,,
,, ..	Ark	..	..	..	3.16	..	3.16	..	3.66	15.60	19.26	..	7 10 0	Arthur Murphy, Ararat
,, ..	Horse Shoe ..	..	..	..	3.50	..	3.50	..	4.70	10.70	15.40	..	8 10 0	Patrick Fitzgerald and Sons, Warragul-road, Bentleigh
Animal Fertilizer ..	A.N.A. Surprise ..	..	..	..	3.00	..	3.00	..	4.00	12.00	16.00	..	10 0 0	George W. Pennell, Braybrook
Bone Fertilizer ..	Bailey Bros. ..	..	..	..	2.50	..	2.50	..	6.50	9.50	16.00	..	8 0 0	Bailey Bros., 155 Main-street, Ballarat East

List of Fertilizers Registered at the Office of Director of Agriculture under the Fertilizers Act 1915 (No. 2652) for the Year 1922—*continued.*

Description of Fertilizer.	Brand.	Nitrogen as Bone.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust	Vauxhall	3.86	23.25	33.70	66.30	9 0 0	William Moore, Panmure
"	Rohs, in circle ..	4.00	18.00	55.00	45.00	10 10 0	P. Rohs Pty. Ltd., Bridge-street, Bendigo
"	White Horse ..	2.50	17.00	60.00	40.00	7 10 0	F. W. Richards, Warrenheip
"	Mt. Clear ..	3.00	18.00	30.00	70.00	8 10 0	Bailey Bros., 155 Main-street, Ballarat East

P. RANKIN SCOTT,
Chemist for Agriculture.

Melbourne, 30th November, 1921.

STALLIONS REGISTERED FOR 1921-22.

under the Horse Breeding Act.

(part III.—Registrations after 16th September, 1921.*)

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1199	Abbotsford Champion	A	Draught ..	C. Elphick ..	Woorarree West
1265	Abbot's Pride ..	A	,, ..	M. McLeod ..	Condah Swamp
1227	Ace of Spades ..	A	Light ..	C. Lippiatt ..	Scotsburn
1200	Agitation	A	Draught ..	J. Ball ..	Werribee
1053	Agitator's Heir ..	A	,, ..	G. R. Aurisch ..	Harkaway
1296	Aird Laddie ..	A	,, ..	E. Yeaman ..	Echuca
1072	Albert Dale ..	3	,, ..	Vaughan Bros. ..	Melbourne
1079	All Tricks	6	Light ..	Mrs. J. C. Millard	Condah
1167	Almont M. ..	A	,, ..	J. Minns ..	Melton
1254	Almost	A	,, ..	D. Lang ..	Tungamah
1278	Amanus	A	Thoroughbred	A. and J. H. Young	Blackheath
1065	Anchorite II. ..	A	Pony ..	J. Rousch ..	Cohuna
1344	Ashville Lad ..	A	Light ..	G. Inglis ..	Tallygaroopna
1256	Astor	A	,, ..	A. Grant ..	Meredith
1092	Attraction's Champion	A	Draught ..	D. Morley ..	Rutherglen
1336	Badaween ..	A	Light ..	B. Folliott-Sandford	Lysterfield
1242	Banker Again ..	2	Draught ..	W. H. Penno ..	Boort
1113	Barney	A	,, ..	L. W. Hyland ..	Benalla
1272	Baron Alexander ..	A	,, ..	Miller Bros. ..	Bacchus Marsh
1274	Baron Alexander ..	6	,, ..	A. F. Russell ..	Barunah Plains
1201	Baron Brilliant ..	A	,, ..	Wyatt Bros. ..	Rainbow
1118	Baron Bute ..	A	,, ..	W. Black ..	Coldstream
1160	Baron Clyde ..	A	,, ..	Cunnington Bros.	Bamawm
1059	Baron Crawford ..	A	,, ..	L. J King ..	Quambatook
1056	Baron Crombie ..	4	,, ..	A. P. Johnston ..	Colbinabbin
1134	Baron Gleniffer ..	A	,, ..	S. J. Lynn ..	Orbost
1052	Baron Jock ..	3	,, ..	M. Lynch ..	Hopetoun
1080	,, Lough ..	A	,, ..	S. Coombs ..	Numurkah
1066	,, Primrose ..	3	,, ..	J. Egan and Sons	Ballan
1003	,, Rosebery ..	4	,, ..	W. Allen ..	Junortown
1290	,, Weerite ..	5	,, ..	Manifold and Co.	Purrumbete
1279	Bay Harold ..	A	Light ..	A. Sutherland ..	Oakleigh
1091	Beaconsfield Flyer ..	A	,, ..	W. A. Syme ..	Eldorado
1228	Beau Gallant ..	A	,, ..	J. Dunlop ..	Birregurra
1006	Ben Kell Major Dale	3	Draught ..	G. Stewart ..	Jerilderie, N.S.W.
1133	Ben Marceline ..	A	Light ..	F. A. Cox ..	Geelong
1164	Black Shepherd ..	3	Draught ..	G. Simpson ..	Tongala
1275	,, Voyage ..	2	Light ..	J. Penno ..	Minmindie
1268	Blackwin ..	5	,, ..	H. W. Grattan ..	Kew
1260	Bleriot	A	,, ..	D. Mitchell and Sons	Staghorn
1099	Bobby	5	Pony ..	G. Officer ..	Woolthorpe
1129	Bold Lad	A	,, ..	J. W. Smith ..	Elmore
1243	,, McGregor ..	2	Draught ..	W. H. Penno ..	Boort
1188	,, Newton ..	5	,, ..	Hehr Bros. ..	Woolert

* For registrations prior to 16th September, 1921, see *Journals* for October and November, 1921.

STALLIONS REGISTERED FOR 1921-22—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1343	Bold Newton ..	A	Draught ..	J. R. Mitchell ..	Sandford
1300	Bonnie Direct ..	A	Light ..	W. T. Taylor ..	Merbein South
1339	Bramhope Royal William	A	Draught ..	G. Wilson ..	Talgarno
1266	Breedon Pioneer ..	A	,, ..	M. C. Ryan ..	Chetwynd
1116	Bright Bells ..	5	Light ..	S. R. Ritchie ..	Thomastown
1082	British Admiral ..	A	Draught ..	T. McMenemin ..	Maldon
1236	Bronte's Pride ..	5	Pony ..	W. A. Jones ..	Dumosa
1259	Bronze Cleve ..	A	Light ..	A. T. Facey ..	Thomastown
1241	Bronzewood ..	A	Thoroughbred	Quinlan Bros. ..	Oakland's Junction
1287	Buck	A	Pony ..	Dolman Bros. ..	Coleraine
1212	Calais	A	Light ..	G. Officer ..	Woolsthorpe
1213	Capshot	A	Thoroughbred	J. G. Davidson ..	Casterton
1214	Carolyn	A	Draught ..	J. Withers ..	Mansfield
1222	Carovita	A	Pony ..	J. Clark ..	Cowwarr
1012	Cedric Hero ..	3	Draught ..	A. W. Giddings ..	Sea Lake
1132	Challicum Punch ..	A	,, ..	W. Kelly ..	Beaufort
1225	Champion of Kelmscott	A	,, ..	W. H. Robinson	Kerang
1321	Chenard	4	Light ..	W. T. Carter ..	Coleraine
1305	Chief Justice ..	A	Pony ..	O. W. Fisher ..	Morgan's Bridge
1192	Chieftain	5	Draught ..	H. Gilmour ..	Thornton
1187	Clan Newton ..	5	,, ..	S. J. Lynn ..	Orbost
1218	Claymore	A	Pony ..	J. P. Hanrahan	Ballan
1148	Cleve Todd ..	3	Light ..	T. A. Hardwick	North Essendon
1161	Clyde Boy ..	A	Draught ..	H. Goldsmith ..	Corac
1319	Colonel Garfield ..	A	,, ..	Colyer Bros. ..	Yea
1271	Colonel Young ..	A	,, ..	W. H. Twigg ..	Janiember
1313	Come More ..	A	Pony ..	C. H. West ..	Buchan
1054	Coronation Day ..	A	,, ..	H. W. Atkinson	Gritjurk
1210	Count Traquair ..	A	Thoroughbred	T. D. Ryan ..	Tatura
1329	Coupar's Best ..	2	Draught ..	Baxter Bros. ..	Mooroopna North
1131	Craigieburn Premier	5	,, ..	F. C. Thomas, jun.	Blackheath
1289	Craigie Masterstroke	A	,, ..	Falkiner and Sons	Widgiewa, N.S.W.
1107	Craigwillie of Bolobek	6	,, ..	W. Walter ..	Tatura
1276	Creeper	5	Pony ..	A. Brown ..	Rosedale
1307	Cross-in-Hand Charmer	A	Draught ..	T. E. Coster ..	Sarsfield
1255	Culloden	A	Light ..	A. Millard ..	Yaapeet
1106	Cutty Sark ..	A	Pony ..	L. Dureau ..	Woodford
1244	Cymbrel	3	Light ..	D. Robbins ..	Korumburra
1224	Cymro Bach ..	A	Pony ..	H. S. Rudduck ..	Melbourne
1347	Cymro Ddu ..	A	,, ..	H. C. Lees ..	Lower Bethanga
1114	Dan Bells ..	A	Light ..	H. G. Gregerson	Benalla
1083	Danedite	A	Draught ..	P. Gardiner ..	Carlisle River
1130	Dandy	A	Pony ..	F. Whitehead ..	Mirboo North
1124	Dandy Direct ..	3	Light ..	L. Harper ..	Rutherglen
1194	,, Geordie ..	A	Pony ..	T. G. McKenzie ..	Yarram
1186	Darling's Comet ..	A	Draught ..	Brook Bros. ..	Moe
1249	Desert Child ..	3	Light ..	J. T. Carroll ..	Molka
1240	Detonator ..	A	Pony ..	Quinlan Bros. ..	Oakland's Junction
1211	Dibdale	A	Light ..	G. Officer ..	Woolsthorpe
1309	Digilista	A	,, ..	S. Nathan ..	Yarra Glen

STALLIONS REGISTERED FOR 1921–22—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1247	Don Huon ..	A	Pony ..	W. Lyons ..	Drouin
1060	Drummond King ..	A	Draught ..	H. and G. Holland	Piavella
1285	Duke	A	,, ..	E. A. Thornley ..	Hawkesdale
1185	Duncan Stewart ..	4	,, ..	J. Fitzpatrick ..	Heyfield
1055	Edgeworth ..	A	Light ..	P. J. White ..	Janiember E.
1062	Emulator Junior ..	A	Pony ..	J. G. Scott ..	Hopetoun
1235	Estelle Junior ..	2	Light ..	D. Green, jun. ..	Nullawil
1004	Ettrickdale ..	A	Pony ..	J. Donovan ..	Yackandandah
1125	Everard Bute ..	2	Draught ..	J. G. Bail ..	Kyabram
1090	Expectation ..	A	Light ..	S. Cameron ..	Quambatook
1078	Fast Time	A	Pony ..	J. Nevitt ..	Toolamba
1269	Field Ambulance ..	A	Light ..	F. Canning, sen...	Stratford
1126	Fire Bells	2	,, ..	J. McFarlane ..	Yarraville
1282	Fluten	A	Pony ..	E. Johnson ..	Romsey
1074	Flying Possum ..	4	,, ..	H. E. Wood and Sons	Mooroopna
1143	Footwork	3	Light ..	J. Chapman ..	Ouyen
1127	Gallant Lad ..	A	Draught ..	A. A. S. Mitchell	Hopetoun
1184	Garnet	A	Light ..	J. J. Carmody ..	Leongatha
1150	Gay Gordon ..	A	Pony ..	J. R. Mitchell ..	Sandford
1067	Glad Star	4	Draught ..	Melbourne and Metropolitan Board of Works	Werribee
1205	Glengarnock ..	6	,, ..	B. McKenzie ..	Bass
1204	Glengarry ..	A	Pony ..	W. L. Stewart ..	Newbridge
1288	Glenmooney ..	5	Light ..	G. H. Palfrey ..	Campbellfield
1335	Glenorchy ..	A	Draught ..	H. Hance ..	Lang Lang
1316	Glynne	A	Light ..	G. Collis, jun. ..	Alberton
1117	Glynne Loch ..	5	,, ..	R. Costello ..	Darriman
1149	Glyn Trustful ..	A	Pony ..	D. Duggan ..	Yinnar
1190	,, Wilton ..	2	,, ..	J. J. Love ..	Mernda
1152	Godwin	A	Thoroughbred	J. H. Bomford ..	Orbost
1303	Golden King ..	A	Light ..	H. Neary ..	Bowman's Forest East
1168	Goldie	A	,, ..	W. J. Minns ..	Melton South
1100	Gospel Bells ..	A	,, ..	J. G. Christie ..	Healesville
1302	Grattan Bells ..	A	,, ..	T. Shearwood ..	Dooen North
1135	Greylight 2nd ..	5	Pony ..	A. Hordern ..	Bowral, N.S.W.
1128	Griffo	A	,, ..	P. Hourigan ..	South Purrumbete
1191	Gypsy Hero ..	A	Draught ..	A. O'Neill and Son	Nathalia
1245	Hamilton Hero ..	A	,, ..	A. Booley ..	Banyan
1073	,, Emulator, Junior	A	Pony ..	Todd Bros. ..	Willenabrina North
1002	Hamiltonian ..	A	Draught ..	J. G. Scott ..	Hopetoun
1013	Harry Rose ..	A	Light ..	A. G. Hunter ..	Elmore
1239	Hero	A	Draught ..	J. Carruthers ..	Picola W.
1317	Hero Laddie ..	A	,, ..	H. F. Robinson	Kerang
1246	Herward Junior ..	6	Light ..	J. A. Haebich ..	Bittern
1155	High Commissioner..	4	Draught ..	F. Bowden ..	Won Wron
1089	Highland Boy ..	A	,, ..	S. Cameron ..	Quambatook
1327	,, Boy ..	A	Pony ..	G. Thomson ..	Koroit
1330	,, Cleve ..	A	Light ..	M. L. Greatz ..	Irymple
1312	Honourable ..	A	,, ..	R. F. Savige ..	Moe
1014	Humoresque ..	3	Pony ..	A. C. Bayley ..	Willaura
1323	Ian Dhu	A	Light ..	N. C. Gibson ..	Joel South
1301	Imperial Crown ..	A	,, ..	T. G. Maher	Purnim

Stallions Registered for 1921-22—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1181	Jack Smith ..	5	Draught ..	S. Maddern, jun.	Leongatha
1293	Jimmy Lea ..	A	Light ..	W. Bradshaw, sen.	Skipton
1081	J. N. S.	A	,, ..	J. N. Spittle ..	Birchip
1318	Jock McCraw ..	4	Draught ..	Williamson and Coghill	Wendouree
1101	Judge Byron ..	A	Light ..	R. Galway ..	Stratford
1163	Kemp Daly ..	A	,, ..	G. H. Minns ..	Melton
1165	Ki Ki	A	Pony ..	J. T. Laidlaw ..	Chetwynd
1015	King Ballance ..	5	Draught ..	J. H. Kennett ..	Kaniva
1098	,, Osterley A. ..	A	Light ..	G. Anderson ..	Newtown
1016	Kingslea ..	3	,, ..	I. N. Hutcheson	Pullut
1189	King's Treasure ..	6	Thoroughbred	G. Ritchie ..	Delatite
1061	King Wilks ..	A	Light ..	J. Brights ..	Mirboo
1262	Laird Again ..	A	Draught ..	P. Davey ..	Miner's Rest
1202	,, Gowrie ..	A	,, ..	F. Corner ..	Rushworth
1311	Lake King ..	A	Thoroughbred	W. G. Smith ..	Yackandandah
1248	Last Mistake ..	A	Light ..	Stock Bros. ..	Sandford
1322	Leeway	A	,, ..	A. J. McGillivray.	Rainbow
1258	Lion	A	Pony ..	G. Brown ..	Merino
1270	Little Jim ..	A	,, ..	W. J. Bowe ..	Maldon
1251	Little Mickey ..	A	,, ..	C. Simon ..	Leongatha
1064	,, Welshman ..	A	,, ..	J. F. Kelly ..	Emu
1310	Llewellyn II. ..	A	,, ..	T. McKendrick ..	Avenel
1281	Lord Aldie ..	5	Draught ..	S. E. Mackieson..	Buchan
1220	,, Bindi ..	A	,, ..	R. T. Yapp ..	Bindi
1109	,, Everest ..	A	,, ..	A. Colvin ..	Nathalia
1215	,, Lonsdale ..	A	Pony ..	D. G. Tomkins ..	Coleraine
1169	,, Osterley ..	A	Light ..	A. Drennan ..	Walpeup
1009	,, Ronald ..	A	Draught ..	E. Allan ..	Ondit
1017	,, Threave ..	4	,, ..	J. Watkins ..	Euroa
1157	,, Wallace ..	5	,, ..	J. Farrell ..	Briagolong
1229	Loudoun Squire ..	A	Light ..	J. Dunlop ..	Birregurra
1122	Lue Ribbons ..	6	,, ..	L. Williams ..	Ross Creek
1216	Lyndale	A	Draught ..	H. Conn ..	Barrakee
1141	McKinney Star ..	4	Light ..	Noel Bros. ..	Terang
1019	Mac's Fancy II. ..	2	Draught ..	Tucker Bros. ..	Kennysford
1144	Macedon Hero ..	4	,, ..	P. Williams ..	Riddell's Creek
1022	Major Albert ..	3	,, ..	J. P. Doherty ..	Rochester
1020	Major Jock ..	A	,, ..	F. C. Glanville ..	Echuca North
1112	Maltstead ..	4	Light ..	E. J. Wright ..	Gormandale
1332	Marcus	A	,, ..	W. E. J. Craig ..	Melbourne
1292	Master Vengeance ..	A	,, ..	W. Bradshaw, sen.	Skipton
1007	Maurite	5	,, ..	D. E. Kervin ..	Cohuna
1217	Menkawrah ..	A	Thoroughbred	J. L. Vallence ..	Cohuna
1021	Merry Jock ..	3	Draught ..	J. Harrison ..	Derby
1018	Merry Lad ..	2	,, ..	T. Sweeney ..	Boolite
1086	Merry Oliver ..	A	Light ..	E. R. de Little ..	South Caramut
1173	Message	A	,, ..	J. Tack ..	Fairbank
1136	Metal Bells ..	3	,, ..	A. Gillis ..	Newmarket
1283	Michael	A	Pony ..	Mrs. Bell ..	Flynn
1137	Mont Roy ..	3	,, ..	H. Sage ..	Somerville
1171	Mountain Palm ..	A	Light ..	E. J. Lukey ..	Warracknabeal
1195	Moving Star ..	4	,, ..	S. Field ..	Mt. Waverley
1097	Musket Bells ..	A	,, ..	J. H. Latta ..	Derrinallum
1088	Native Prince ..	A	Draught ..	R. McKenzie ..	Woodford
1010	Newton Bold ..	6	,, ..	L. J. King ..	Quambatook
1159	Newton Lad ..	A	,, ..	T. H. Tink ..	Serviceton
1096	Nimrod	A	Pony ..	G. Small, jun. ..	Birchip

STALLIONS REGISTERED FOR 1921-22—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1102	Non Pariel ..	3	Draught ..	W. Geddes ..	Boomahnoomoonah
1021	Ochtertyre Sturdy ..	5	,, ..	D. Ervin ..	Pyramid Hill
1263	October	A	Light ..	W. Wilson ..	Cobram
1162	O.K.	A	,, ..	A. G. Roberts ..	East Brunswick
1151	Onward Star ..	A	Draught ..	J. Murchison ..	Dumbalbalane
1070	Osprey Junior ..	A	Light ..	J. Axford ..	Terang
1333	Oster Direct ..	A	,, ..	J. Corry ..	Barmah
1024	Ostrich Lad ..	2	Pony ..	A. Rose ..	Penshurst
1077	Our Bobby ..	A	,, ..	W. H. Gardiner	Lurg
1264	O. Y. K.	A	Light ..	G. H. Palfrey ..	Melbourne
1025	Paceaway ..	A	,, ..	T. H. Clyne ..	Echuca
1299	Palos	A	,, ..	R. Warren ..	West Moolap
1297	Perfection ..	A	,, ..	E. A. Baker ..	Gilleston
1026	Peter	A	,, ..	J. Carroll ..	Myrtleford
1221	,, ...	A	Pony ..	J. Abrahams ..	Fitzroy
1342	Polo King ..	A	,, ..	W. H. J. Baker	Portland
1286	Pompy	5	,, ..	E. H. B. Cleland	Cowes
1087	Predominate ..	A	Light ..	E. R. de Little ..	South Caramut
1104	Prince Alexander 2nd	A	Draught ..	D. and J. McNabb	Morwell
1115	Prince Baron ..	2	,, ..	G. Crabbe ..	Yeo, Colac
1233	,, Binnia ..	A	Light ..	C. Nolte ..	Merino
1005	,, Bronte ..	4	Pony ..	E. Davey ..	Charlton
1180	,, Clifton ..	3	Draught ..	Exors. late D. Mitchell	Lilydale
1324	,, Denver ..	A	Light ..	H. Bambridge ..	Northcote
1174	,, Rhymney ..	5	Pony ..	E. Kennedy ..	Bass
1341	,, William ..	A	Draught ..	W. R. Berger ..	Devenish
1105	Principal	A	Light ..	J. Kosch ..	Byaduk
1198	Quality	4	Pony ..	A. E. Callow ..	Ballarat
1232	Quatta's Belmont ..	5	Draught ..	M. Lindsay ..	Beranduda
1291	Radium	5	Light ..	Manifold and Co.	Purrumbete
1027	Real Scotch ..	4	Draught ..	J. Rumbold ..	Maldon
1193	Red King	A	Light ..	W. Holland ..	Benambra
1197	,, Lion	6	Thoroughbred	G. Tantram ..	East St. Kilda
1028	,, Lion	4	Pony ..	G. H. Whitehead	Minhamite
1057	,, Wilkes ..	A	Light ..	E. Rash ..	Ballarat
1094	Richard Cleve ..	A	,, ..	G. E. Hodgins ..	Hastings
1103	Richard III. ..	A	Pony ..	A. Ruttle ..	Inverloch
1170	Ringmaster ..	A	Draught ..	A. Drennan ..	Walpeup
1063	River Bells ..	A	Light ..	J. Byrne ..	Toora North
1238	Roala	2	Pony ..	B. E. Lyon ..	Coleraine
1325	Ronya's Bells ..	4	,, ..	W. M. Saynor ..	Hawthorn
1029	Royal Bill.. ..	3	Draught ..	V. Wyatt ..	Rainbow
1145	Royal Bute ..	3	,, ..	W. M. Black ..	Coldstream
1030	,, Craig ..	3	,, ..	D. Trewick ..	Elmore
1346	,, Flush ..	A	,, ..	J. Rochford ..	Byaduk
1031	,, Hero ..	3	,, ..	James Bros. ..	Merrigum
1032	,, Marksman ..	2	,, ..	W. Dahlenburg ..	Salisbury
1069	,, Robin ..	A	,, ..	A. Pyers ..	Charlton
1250	,, Standard ..	A	,, ..	J. Christie, jun...	Katunga
1298	Rysharold.. ..	A	Pony ..	A. H. Hunt ..	Lancefield
1033	Safe Voyage ..	5	Light ..	V. Meyers ..	Lockwood
1147	Sailor King ..	3	,, ..	J. Round ..	Buckrabanyule
1237	Sandy's Fashion ..	2	Draught ..	E. Haines ..	Gerung
1182	Scotch Thistle ..	3	,, ..	J. Power ..	Strathallan
1345	Scottie	A	Pony ..	L. McDonald ..	Hamilton

STALLIONS REGISTERED FOR 1921-22—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs			
1154	Seldom Seen ..	2	Draught ..	W. Dugdale ..	Bacchus Marsh
1085	Selkirk	A	Light ..	A. Scott ..	Elmore
1034	Senator	5	Draught ..	Wittenow Bros. ..	Murmungee
1253	Several	A	Thoroughbred	N. Boyd ..	Franklinford
1277	Shandon Bells ..	A	Light ..	A. Missen ..	Truganina
1058	Shifty Dick ..	A	,, ..	J. Foster ..	Casterton
1257	Silver Abbey ..	3	,, ..	A. C. McLennan	Clunes
1179	Sir Bute	4	Draught ..	Clyne Bros. ..	Tinamba
1008	,, Clyde	5	,, ..	S. J. Taylor ..	Lake Boag
1075	,, Everest ..	4	,, ..	A. Ralston ..	Lucknow
1175	,, George ..	5	,, ..	E. J. Griffiths ..	Tongala
1273	,, George.. ..	5	Pony ..	I. K. Russell ..	Hesse
1178	,, Harold ..	5	,, ..	Mrs. N. Rose ..	Epping
1280	,, Northcote ..	2	Draught ..	G. Madden ..	Batesford
1183	,, Richard 2nd ..	A	Pony ..	W. Henderson ..	Grasmere
1035	,, Robert Newton	4	Draught ..	P. Lawrie, jun. ..	Rushworth
1110	,, Whyee ..	A	Light ..	W. E. Johnstone	Woodford
1304	,, William Wallace	A	Draught ..	O. W. Fisher ..	Morgan's Bridge
1095	Solomon IV. ..	A	,, ..	C. H. Perkins ..	Rainbow
1036	Some Style ..	5	Light ..	F. Armstrong ..	Campbell's Creek
1037	Southern Lad ..	4	Draught ..	G. McKenzie ..	Pullut
1038	Speculation ..	4	Light ..	Bourke and Quinn	Rochester
1039	Squib	5	Pony ..	A. Robertson ..	Willaura
1040	St. Aidan	4	Light ..	M. Cribbes ..	Faraday
1041	Standard	5	Draught ..	J. G. Scott ..	Hopetoun
1308	Standish Direct ..	A	Light ..	T. Kelly ..	Barraport
1337	Stirling Castle ..	A	Draught ..	V. M. Henry ..	Cowes
1042	Stockman's Lad ..	3	,, ..	J. F. Schulz ..	Lake Hindmarsh
1177	Sugar King ..	3	Thoroughbred	D. J. Weekes ..	Stratford
1158	Sunny Simon ..	3	Light ..	A. McDonald ..	Nagambie
1156	Swimming Belt ..	A	,, ..	W. T. Cox ..	Moolort
1123	Taffy	A	Pony ..	T. J. Morrissey ..	Beeac
1120	,, ...	6	,, ..	J. Sargent ..	Yanac
1119	Take Bells ..	A	Light ..	W. Kelly ..	Redesdale
1044	Tamie O'Groat ..	3	Draught ..	A. L. Pitts ..	Merrigum
1043	Tam O'Shanter Bill..	A	Pony ..	P. Gordon ..	Ellerslie
1348	Territorial ..	A	Draught ..	R. M. Thomas ..	Devon North
1045	The Hague ..	A	Thoroughbred	S. Winter-Cooke..	Hamilton
1223	The Joker ..	A	Pony ..	A. E. Ellery ..	Redesdale
1172	The Nipper ..	A	,, ..	T. H. Bush ..	Pennyroyal
1320	The Premier ..	A	Draught ..	J. Roberts ..	Kumat
1328	The Trick ..	A	Light ..	W. Mellington, jun.	Beulah West
1206	The Vanquisher ..	A	Thoroughbred	G. W. Horne ..	Lal Lal
1334	This Time ..	A	Pony ..	H. Hance ..	Lang Lang
1207	Thunder Jewel ..	A	Thoroughbred	T. Daffy ..	Swan Marsh
1111	Tinytown ..	5	Pony ..	J. Deane ..	South Yarra
1284	Tom Pepper ..	A	,, ..	E. A. Thornley ..	Hawkesdale
1140	Tony Bells ..	A	Light ..	R. K. McLennan	Marnoo
1153	Towyvale Flyer ..	A	Pony ..	W. J. Cadman ..	Thougla
1076	Tra George ..	A	Thoroughbred	W. E. Hayes ..	Leongatha
1208	Trilight	A	Light ..	R. P. Nicol ..	Yarram
1071	True Blue ..	2	Draught ..	C. S. Maddern ..	Kaniva
1203	Truro	A	Light ..	M. J. O'Brien ..	Hamilton
1011	Udale	A	Draught ..	A. Gillis ..	Newmarket
1046	Unit	3	Pony ..	B. Rogers ..	Mepunga East

STALLIONS REGISTERED FOR 1921–22—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1295	Valice Direct ..	5	Light ..	J. Pretty ..	Glenhuntly
1047	Val Royal ..	3	Draught ..	J. C. Wallis, sen.	Miram
1340	Valve	A	Pony ..	W. C. Younger ..	Hansonville
1146	Vice Royal ..	2	Draught ..	W. Black ..	Coldstream
1326	Venture	A	Pony ..	L. E. King ..	Violet Town
1209	Volunteer ..	A	,, ..	T. B. Waters ..	Corryong
1338	Wakepan	A	Light ..	A. W. Johnson ..	Whoroughly
1138	Waratah	4	Pony ..	A. R. Dalton ..	East St. Kilda
1166	Wee McGregor ..	4	,, ..	J. T. Laidlaw ..	Chetwynd
1230	Welsh Flyer IV. ..	A	,, ..	J. Williams ..	Nalinga
1049	White Star ..	4	Light ..	G. Kelly ..	Powlett Plains
1048	Widgiewa Sapper ..	4	Draught ..	F. J. Schultz ..	Cowangie
1226	Wigtonshire ..	A	,, ..	Burton Bros. ..	Dennison
1068	Wonder	6	Pony ..	W. McEvoy ..	Alexandra
1314	Yarraview Mark ..	2	Draught ..	A. E. T. Payne ..	Lilydale
1315	Young Albyn ..	A	,, ..	J. Watkins ..	Euroa
1139	Young Caesar ..	3	Pony ..	A. E. Hoadley ..	Melbourne
1050	,, Dan ..	3	Draught ..	J. C. R. Tonkin ..	Mt. Jeffcott
1306	,, Hamilton Hero	3	,, ..	Bateson Bros. ..	Cowangie
1084	,, Lord Lyon ..	A	,, ..	G. R. Main ..	Malmsbury
1196	,, Lymm Champion	2	,, ..	W. H. Penaluna	Boolarra
1234	,, Major ..	5	,, ..	C. Gould ..	Tatyoon
1176	,, Portable ..	3	Light ..	E. Waller ..	Orbost
1294	,, Prince ..	A	Draught ..	W. Splatt ..	Inverleigh
1121	,, Prince Royal	A	,, ..	W. D. Gibb ..	Moyhu
1108	,, Recruit ..	A	Pony ..	E. W. Waters ..	Echuca East
1051	,, Royal Oak ..	A	Draught ..	G. Reid ..	Merbein
1219	,, Rysharold ..	A	Pony ..	W. Brown ..	Fitzroy

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

If the work has not already been done, the orchard should be kept in constant cultivation so as to conserve the abundant spring rains. Should the summer become hot and dry, this will be a very necessary precaution. Even where the soil had been previously well cultivated, the cultivators should again be run over the surface, as any hot weather will cause the soil to crust, which would be the means of dissipating a very considerable amount of soil water. Every effort should be taken to retain this moisture so that the fruit crops shall have all they require for their perfection. To further attain this end no weeds should be allowed to grow in orchard soils.

BUDDING.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked towards the end of the month. It is advisable to select dull, cool weather for this operation, so that the sap may run more freely, and that atmospheric conditions may not have too drying an effect on the bud. The operation of budding is a very simple one, and is easily performed. To gain a successful end, the sap should be flowing freely, so that when the cuts are made the bark should "lift" or "run" easily, and without any clinging or tearing of the fibres, and it should separate freely from the wood. The bud selected should be firm and well matured, and should show no signs of premature growth whatever. It should be cut from the scion with a shallow cut, and if any wood be left in the cutting it should be taken out of the bud. A smooth, clean spot should be selected on the bark of the stock, and a T-shaped cut made, the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised, and the bud inserted between the bark and the wood of the stock. The bud should be gently pressed down into position, and then bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level by means of a horizontal cut. With practice it will soon become possible to take the buds so that they will need neither cutting nor trimming.

After two or three weeks the buds should be examined to see if they have "taken"—that is, if the bud has united thoroughly to the stock. When this occurs, the tie may be cut. If a growth be desired at once all wood above the bud may be cut off some short distance above the bud, so as to prevent any bark splitting, and consequent loss of the bud, and so as to throw the bud out at a fair angle. Ultimately this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter till spring. In this case the branch should not be cut off, but left on till the usual winter pruning.

SUMMER PRUNING.

The profuse spring and summer rains have caused a vigorous growth in the fruit trees. In order to more economically utilize this abundant growth, it should be now summer pruned, particularly on the apple and pear trees. Care should be observed that as much of the leafage as possible is retained on the tree. Unduly long laterals of fruiting trees may be shortened back, always cutting to a leaf. Unnecessary terminal leader growths, of which there are sometimes three or four, all strong growing, may be reduced to one, retaining this one as a leader. In no case should this growth be cut or interfered with in any way.

The results of these cuts will be to divert the sap which was flowing into growths that would subsequently be pruned, into more profitable channels, so that weak buds and growths may be strengthened, and induced into fruit bearing.

The Vegetable Garden.

The work in this section is much the same as in the flower garden. Good mulching and regular soil stirring will be the work for the month. As soon as any bed is cleared of vegetables it should be manured and

well dug over in preparation for the next crop. Deep digging is always desirable in vegetable growing. If any pest, such as aphis, or caterpillars, or tomato weevil, have been present, it would be advisable to burn all the crop refuse, or to destroy any insects that remain, and to give the plot a dressing of gypsum, or of Clift's manurial insecticide.

Keep the tomatoes well watered and manured, pinching out surplus and strong grown laterals. In early districts the onion crop will be ripening. In late districts, or with late crops, the ripening may be hastened by breaking down the top. An autumn crop of potatoes may be planted. Cabbage, cauliflower, lettuce, and celery plants may be planted out. Keep asparagus beds well watered.

The Flower Garden.

January should be a busy month in the garden. It may be necessary to water frequently, and after every watering the surface should be well loosened, and stirred with the hoe to keep it moist and cool. More cultivation and less water is a good rule to be observed. The hoe should be used more, and the hose less, in summer; greater benefits will accrue, and the water bill will be considerably reduced. Mulchings with straw, grass, &c., are very useful just now. The mowings from lawns form valuable mulching. Waste tobacco stems are also valuable as a mulch.

Dahlias, chrysanthemums, and other tall-growing, slender herbaceous plants will require support in the way of stakes. They will also need mulching considerably. These plants should receive no check whatever, and should be continued with a regular even growth right through the season. Another desideratum is that soils should be well drained, as plants of all descriptions thrive better in well-drained soils.

A sharp look-out should be kept on these plants for attacks of red spider. If this insect appears, a good spraying of tobacco solution or benzole emulsion should be given.

Constant watch will need to be kept for the various small caterpillars that attack the buds of these plants. Spraying with a weak solution of paris green and lime, or similar insecticide, will be useful. Hand-picking should also be resorted to.

REMINDERS FOR FEBRUARY.

LIVE STOCK.

HORSES: *At grass.*—Supplement dry grass, if possible, with some greenstuff. Provide plenty of pure water and shade shelter. *In stable.*—Supplement hard feed with some greenstuff, carrots, or the like, and give a bran mash once a week at least. Avoid over-stimulating foods, such as maize and barley. Give hard feed in quantities only consistent with work to be performed. Stable should be well ventilated. and kept clean. When at work, give water at short intervals. Always water before feeding. Great benefit will result in supplying horses—more especially young ones running at grass—with a lick. The following one is recommended:—

Salt	20 parts
Lime	20 parts
Superphosphate	10 parts
Sulphate of iron	5 parts.

By having troughs constructed that will protect the lick from rain a considerable saving will be made.

Horses at grass require their feet attended to at frequent intervals, otherwise deformity of feet and lameness may result.

CATTLE.—Provide succulent feed and plenty of clean water easy of access; also shade and salt lick in trough. Have each cow's milk weighed and tested for butter fat regularly. Rear heifer calves from those that show profitable results. Give milk at blood heat to calves. Keep utensils clean or diarrhœa will result. Do not give too much at a meal for the same reason. Give half-a-cup of limewater per calf per day in the milk. Let them have a good grass run or lucerne, or half-a-pound of crushed oats in a trough. Dehorn all dairy calves except those required for stud or show purposes. Keep bulls away from cows.

PIGS.—Sows about to farrow should be supplied with short bedding in well-ventilated styes. All pigs should be provided with shade and water to wallow in. There will be plenty of cheap feed available now, and there is a good margin between cost of feed and price for fat pigs. Read *Bulletin* No. 16.

SHEEP.—In the case of very strong cross ewes, rams should not be removed until well on in this month, for this class, together with most pure ewes of British blood, are only now coming in season. To breed out this late lambing tendency, and to procure quality and quantity of wool as well as a good carcass, use carefully-bred, level-made merino rams. If the right type be not procurable at reasonable rates, use good Corriedales or Comebacks. Should there be among the rams any distinctly inferior to the others, keep them back for three weeks. Remember, narrow inferior rams are invariably the most active workers compared with sheep of more substance.

CULTIVATION.

FARM.—See that haystacks are weatherproof. Cultivate stubble and fallow, and prepare land for winter fodder crops. Get tobacco sheds ready for crop. In districts where February rains are good, sow rye, barley, vetches, and oats for early winter feed.

ORCHARD.—Spray for codlin moth. Search out and destroy all larvæ. Cultivate the surface where necessary and irrigate where necessary, paying particular attention to young trees. Fumigate evergreen trees for scale. Continue budding.

FLOWER GARDEN.—Cultivate the surface and water thoroughly during hot weather. Summer-prune roses by thinning out the weak wood and cutting back lightly the strong shoots. Thin out and disbud dahlias and chrysanthemums. Layer carnations. Plant a few bulbs for early blooms. Sow seeds of perennial and hardy annual plants.

VEGETABLE GARDEN.—Continue to plant out seedlings from the seed-beds. Sow seeds of cabbage, lettuce, cauliflower, peas, turnips, and French beans. Keep all vacant plots well dug.

VINEYARD.—February is the best month for the "yema," or summer bud graft (see *Bulletin* No. 35, available on application). Select and mark the best-bearing vines of varieties from which scions will be required for next spring's grafting.

Given suitable climatic conditions, downy mildew will make its appearance. If vines were not sprayed in January they should be sprayed this month. The final spray (January or February) is most important for the protection of the foliage, thus insuring the ripening of the fruit and well-nourished wood, without which a good crop cannot be expected next year. Sulphur again if oidium is prevalent, but avoid sulphuring wine grapes too short a time before gathering. The sulphur may be mixed with Bordeaux mixture, thus enabling the two diseases, oidium and downy mildew, to be combated simultaneously.

Cellars.—Prepare all plant and casks for the coming vintage. An ounce of bisulphite of potash, or a couple of fluid ounces of bisulphite of soda solution, to each bucket of water used to swell press platforms, tubs, &c., will help to keep it sweet. Keep cellars as cool as possible. Complete all manipulations so as to avoid handling older wines during vintage.

In the case of very hot weather occurring during vintage, attention is directed to the new wine-making method by "Preliminary Maceration," described in this issue.

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BEULAH CROP AND FALLOW COMPETITIONS, 1921.

Report of the Judge, H. A. Mullett, B. Ag. Sc., Chief Field Officer.

I have pleasure in forwarding herewith my awards and report as judge of the 1921 crop and fallow competitions organized by your Society at Beulah. As you are aware, because of the unfavorable weather conditions, it was decided to defer the judging of the fallows till early in the new year. This report, therefore, concerns the crops only.

Beulah is one of the Mallee districts among the first settled in Victoria. The advent of the stump-jump plough, and the success of the mallee-roller in cheaply clearing this class of land of its timber, fired the imagination of settlers from the adjoining districts. In spite of all sorts of pessimistic predictions that the dense thickets of mallee covered nothing but a sandy desert, hardy pioneers took teams and trekked into the scrub. They rolled and burnt patches of mallee, and almost without any other preparation sowed the grain on the loose soil and ashes, and left for civilization. Returning eight months later they found splendid crops awaiting them. They had proved that the Victorian Mallee would grow payable crops of wheat.

The countryside has seen many alterations since then. Gradually the unkempt appearance of the partly-cleared land has been changed for well-ordered wheat fields and thickly-grassed paddocks. A water supply by channel, for both stock and domestic purposes, has replaced the old Government dams, and comfortable homesteads the tumbledown bush huts of the pioneering days. The texture of the soil has been altered, too, by cultivation and the tramping of stock, from a light, free, sandy loam to something approximating to a clay loam. Sandy rises that "blow" in the wind after rain, of course, still exist, but the country has consolidated wonderfully well.

Originally the land was selected in 640-acre blocks, but most farms now consist of aggregates of several blocks. Originally the settlers were forced to closely crop the cleared land by sowing wheat year after year on the stubbles. But for many years now the blocks have been well fenced; sheep have been installed, fallowing is practised, and general rotation farming adopted. Every year now in this country there is a fair area of oats for hay and grain sown on stubble land on each farm, and it is beginning to be realized that oats sown solely for feed is also a payable proposition. Some grew them on fallow and are pleased with the results.

In a few cases the aggregation of blocks has reached considerable proportions. These are generally, at least, 7 or 8 miles from the railway, and may consist of from five to ten blocks. But recently, thanks to the repatriation movement, the process has been arrested, and even reversed. Leisfield's is one large estate which was bought for subdivision by the State. Fifteen soldiers and their families have been

A Heavy Crop of Algerian Oats Grown on Fallow—Beulah.

settled on it. Within a radius of 25 miles of Beulah there have been settled some 150 returned soldiers. Most of these men look to District Inspector Redding and to members of the Beulah Agricultural Society for instruction on some of the finer points of wheat farming. The help has been cheerfully given, and the results are good.

One of the things the Beulah Agricultural Society has done is to organize this crop and fallow competition largely for the benefit of the men. There is a special section in which they may compete, and the response has been very satisfactory, fifteen men taking part this year. Some men have grown much better crops than others, and usually their success has been proved to be not a matter of luck, but of good management. The methods followed in the growing of the best crops are set out below. They may serve as object lessons for any who care to profit by them. Side by side are tabulated the methods of the older established farmers of the district who were competitors

in another section. Here also there are valuable lessons that those who run may read:—

Results.

SECTION I.—RETURNED SOLDIERS' COMPETITION FOR THE BEST 100 ACRES OF WHEAT.

Name.	Yield.	Trueness to Type.	Disease.	Weeds.	Evenness.	Total.
Maximum Points ..	35	20	15	15	15	100
J. R. Kennedy ..	35	17	15	15	14	96
J. Bryant	29	19	14	14	15	91
H. V. George ..	30	18	14	12	14	88
Chester Guley ..	30	16	13	12	15	86
C. H. Guley	26	16	13	14	15	84
J. C. Hunter	27	15	12	11	13	78
E. Pendlebury ..	21	19	9	14	14	77
T. H. M. Cullen ..	29	11	10	14	13	77
T. A. Millar	24	15	6	14	14	73
W. Shannon	20	17	12	10	12	71
Annear Bros. ..	19	17	11	12	11	70
P. J. Lawler	16	15	9	15	14	69
S. Walton	23	14	8	11	12	68
C. Hunt	17	16	8	10	10	61
J. H. Wheatland ..	15	17	6	12	10	60

Note.—The winning crop was estimated to yield more than 35 bushels per acre. The points for yields are not expressed in bushels per acre. The differences between them, however, are as near as possible in bushels per acre.

The winning crop, grown by Mr. J. R. Kennedy, was easily the heaviest in the competition. The crop (Penny) was a very clean and dense one, but rather too tall for safety in heavy weather or for ease in stripping. A notable feature of this crop was its singular freedom from red rust, a disease which, this year, attacked the Federation crops of the district more or less severely. Penny has proved also its rust resistance in Western Australia. For Mallee conditions it is a useful wheat. At the experimental plots at Warracknabeal, during the past five years, it has proved superior to Federation. It does not stand as well as Federation, however, but cannot be called weak in the straw. It has a large grain, and should be sown rather heavier than Federation.

Mr. Kennedy gave the land a thorough preparation and sowed the crop early in June; 80 lbs. of seed were used, and about 94 lbs. of superphosphate. The land was given no less than eight separate workings, including the initial ploughing. Most of the work was done with the combined drill, with which also the crop was sown. The land was ploughed in August, worked twice before harvest with the drill, then twice after harvest up till the end of May. It was then drilled and harrowed twice. Where the land is sufficiently free from stumps, there is no doubt that a spring-toothed implement is an ideal one for mallee land.

The crop exhibited by Mr. J. Bryant was Federation. It was reasonably pure, and very even throughout the field. The land was ploughed in April, May, and June, then harrowed, then spring-tooth cultivated twice, and finally harrowed and left till harvest. Subsequently it was spring-toothed twice, and then sown with the combined

spring-toothed cultivator-drill at the end of May, and early in June; 70 lbs. of seed and 74 lbs. of superphosphate were used. There is no doubt that the very thorough way in which the cultivation was carried out is the factor most responsible for the success of this crop.

Mr. H. V. George's crop of Federation was heavier than most. Points were deducted because of the presence of some wild oats and charlock. This paddock, of 180 acres, was summer-fallowed. The land was in oats previously. The oat stubbles were disced in March, then the scarifier was used in July, and a stroke of the harrows was given. In August the fallow was spring-toothed, scarified in September, and was left undisturbed until it was re-scarified at the end of the following April. The spring-tooth was used to work up the land in front of the drill, and the crop sown towards the end of June, 1¼ bushels of seed and 70 lbs. of manure being used. Here will be noticed the judicious interchange of spring-tooth and scarifier. In all seven workings were given. Mr. George believes that summer fallowing gives him better yields than land treated in the usual way.

Mr. Chester Guley also submitted a heavy crop. That of Mr. T. H. N. Cullen was, for the most part, very tall—a water channel had overflowed its banks and helped the crop, but it had also induced rust, which was very noticeable.

A number of the other crops were somewhat affected with smut.

Results.

SECTION II.—OPEN COMPETITION FOR BEST 100 ACRES OF WHEAT.

Name.	Yield.	Type.	Disease.	Weeds.	Evenness.	Total.
Maximum Points ..	35	20	15	15	15	100
Mrs. M. A. McCreddan	32	16	15	14	14	91
Schneider Bros. ..	30	18	15	13	14	90
A. P. Couzner ..	28	19	13	14	15	89
W. L. McAllister ..	28	19	13	15	13	88
W. J. Collins	29	19	10	15	15	88
H. V. George ..	30	18	14	12	14	88
J. R. May	25	20	14	14	15	88
Mrs. M. Schneider ..	31	16	13	11	15	86
R. George	29	18	12	13	13	85
Errol Schneider ..	26	18	13	12	12	81
W. T. Fish	24	17	12	10	14	77
T. H. M. Cullen ..	29	11	10	14	13	77
T. A. Millar	24	15	6	14	14	73

Note.—The points for yield do not give the actual yield in bushels per acre. The actual yields were estimated as greater than the figures indicated. The differences, however, represent bushels.

The winning crop in this section, that of Mrs. M. A. McCreddan, of Reedy Dam, though a fine one, was not as heavy as that of the winner of Section I. The 100 acres shown consisted of Dart's Imperial, Federation, and Penny. The Dart's Imperial was of exceptionally good appearance—dense, even, and level. There were a few strangers present, but it was entirely free from any disease. The Federation and Penny were somewhat less regular.

The fallow on which this crop was grown had been well worked, and liberally seeded and manured. To careful attention to those points

its success is due. The fallow was ploughed in June and July; it was then harrowed, then scarified. Later on in the spring a further harrowing, scarifying and harrowing were given. After harvest time, following a rain, the spring-tooth cultivator was worked. Finally, the land was spring-toothed, drilled, and harrowed in June, 85 lbs. wheat and 90 lbs. superphosphate being used. There were no weak patches in the crop, and it was well headed.

The crop awarded second place was that of Messrs. Schneider Brothers; 130 acres of Federation were shown. The crop was very even throughout, it was reasonably pure, and there were no weeds; it had been slightly damaged by hail. Again, this is a crop which was sown on well-worked land, with a liberal dressing of seed and manure. The fallow was July-ploughed, then harrowed. In the spring it was skim-ploughed, then spring-toothed, then harrowed, then spring-toothed, and reharrowed. After harvest it was spring-toothed again in April, skim-ploughed and sown; 95 lbs. of seed and 95 lbs. of super. were used.

A Repatriated Soldier's Crop of Federation. (Chester Guley, Beulah.)

The crop of Federation, exhibited by Mrs. M. Schneider, appeared to be rather heavier than that just referred to; it had also been affected by hail. Points were deducted for the presence of charlock, and a little black rust; 100 lbs. of seed and 100 lbs. of superphosphate were used per acre.

Mr. W. J. Collins' crop of Federation was also a good one. It was especially well headed, even, and very pure indeed. Points were lost on the score of disease; 110 lbs. of seed was used, with 110 lbs. of superphosphate. The crop was drilled in June.

Mr. A. P. Couzner's crop of Federation was drilled late in June. The seed was true to type, and the paddock very even; 70 lbs. of seed and 120 lbs. super. were used.

Mr. W. L. McAllister's crop was somewhat uneven. Some of it was very heavy. The land was winter-fallowed, well worked, and then sown at the end of May, and early in June, with 70 lbs. of seed and 100 lbs. superphosphate. The crop was very free from strangers. The best crop, however, from this point of view was that of J. R. May. Full marks were scored for purity.

Seeding and Manure at Beulah.

It will come as a surprise to many to learn of the heavy applications of seed and manure that have been given by most of the competitors in the open section. There was a time when 45 lbs. of seed and 30 lbs. of superphosphate were thought to be ample for mallee land. But the times have changed since then. The land is now given a most thorough preparation for the crop, which results in increased supplies of moisture being stored in the fallows, and in extra supplies of plant food being liberated, especially of the sorts other than phosphatic. It follows that each acre of land will support more plants, hence the increased rate of seeding, which must be accompanied by extra quantities of phosphorus, the most deficient element in the soil. While there is no doubt that the old-time rate of seeding is now too light, it is open to question whether amounts of seed as high as

Cutting a heavy crop of Algerian Oats grown on Fallow. (Mr. W. T. Fish, Beulah.)

some of those given are beneficial. The results at Longerenong show that there is no advantage in sowing more than 70 to 80 lbs.; but, of course, that is on a different class of soil. Similar tests have not been carried out on mallee land in Victoria. Those who seed heavily at Beulah are, however, supported by the practice on mallee land near Dimboola—where some successful farmers are sowing from 1½ to 1¾ bushels. They do it because the germination there is found to be rather less than might be expected.

Fallowing Mallee Land.

There is no doubt that it pays to work fallow well in the Mallee, just as it pays to do so in the Wimmera. But it must be done with skill. It is easier to ruin fallowed land in the Mallee by injudicious cultivation than almost anywhere else. If the land is stirred too deeply, or is persistently cultivated when dry, the "take-all" disease is almost bound to make its presence felt severely. The successful

competitors in this competition have shown how the work should be done. The initial ploughing should be made early, and done thoroughly; 3½ inches is deep enough. Then rubbish must be killed in the spring as it germinates. The scarifier and the spring-tooth appear to be better implements than the skim-plough. The spring working should not be made as deep as the original ploughing. Subsequently, after any summer rains, the harrow or spring-tooth cultivator should be kept going while the ground is reasonably moist. Great care must always be taken to keep heavy implements from stirring the fallow too deeply. Many a Mallee fallow has been ruined because of the necessity for discing paddymelons. The heavy disc stirred up the land too deeply, and it could not be consolidated. One crop in the Soldiers' competition had been seriously affected in this way.

Paddymelons should be tackled as soon as they show through, even though the land be worked somewhat on the dry side. The use of the disc can often be thus avoided. One or two crops on the back country were not as heavy as they might have been, because of the influence of the mallee shoots prior to fallowing. Sheep are, of course, invaluable for trimming weeds and consolidating the land.

Stinking Smut.

A number of crops in the district were smutted, especially among the soldier settlers. In some cases heavy loss had occurred, and in others there was enough smut present to seriously infect the seed for next year's crop. It is, of course, not good policy to sow infected seed, but, in any case, the pickling should be done with a most careful attention to detail. If bluestone is used the correct strength is 1½ lbs. to 10 gallons of water. The seed should be poured from the bags into a perforated vessel standing in the solution, then stirred and skimmed. The wheat should be immersed for three minutes by the watch. All bags should be pickled, and the drill, if infected, cleansed with formalin. When making up a fresh supply of pickle to replace that used, the same formula should be used. It is courting failure to guess the quantities of water, or of the pickle. To dissolve bluestone quickly, suspend it just under the surface of the water in a hessian bag.

With formalin the standard strength is 1 lb. of formalin to 40 gallons of water, and the immersion three minutes. Wheat pickled in formalin may not be kept for longer than a few weeks without injury to its powers of germination.

Wimmera Rye Grass.

An interesting stand of Wimmera rye grass was seen at W. L. McAllister's place. Mr. McAllister finds it excellent feed, and manages to grow good wheat crops as well. He finds that summer fallow will keep the grass in check. Between June and harvest on 100 acres of the rye grass, 500 sheep, 20 cattle, and 35 horses were maintained. Its extensive seeding is not advocated on properties where the fallows are not thoroughly cultivated.

In conclusion, I desire to thank the secretary, Mr. A. J. Williams, for the efficient management of the transport arrangements, which greatly facilitated the work of judging.

CROP AND FALLOW COMPETITIONS, KANIVA, 1921.

Report of the Judge, J. Keane, B.Ag.Sc., Science Field Officer.

The Crop and Fallow Competitions conducted this year by the Kaniva Agricultural and Pastoral Society were divided into four sections as follows:—

Section A.—Best 75 acres of crop.

Section B.—100 acres of fallow, 1920, and the crop of 1921—the total of points for both the fallow and crop to be considered.

Section C.—Best 100 acres of fallow.

Section D.—100 acres of fallow, 1921, and the crop of 1922—the total points for both the fallow and crop to be considered.

The entries received for these four sections totalled thirty-two, compared with twenty for last year. This is a satisfactory entry, and it is to be hoped that the members of the society will continue to support the competition. These competitions are held not only to promote a feeling of friendly rivalry among farmers, but mainly with a view to determining the best crops in the district and the methods by which those crops have been raised. The knowledge obtained in this way is disseminated among the farmers and should eventually be the means of improving farming practices, thus increasing the yields obtained.

DETAILS OF RESULTS.

Section A—Best 75 Acres of Crop.

Name.	*Yield.	Trueness to Type.	Evenness.	Disease.	Weeds.	Total.
Possible points ..	**35**	**20**	**15**	**15**	**15**	**100**
Kennett Bros. ..	34	19	14	15	13	95
A. E. Sanders ..	35	19	15	10	14	93
Crouch Bros.	33	18	13½	13	12½	90
A. W. Goodwin (*b*) ..	35	17½	13	12½	12	90
O. A. Hendy	32	18½	13½	14	11	89
A. E. Williams ..	31	19	12½	12	13	87½
R. M. Williams ..	33	18½	14	10	11	86½
R. Barber	33	17	14	8	13	85
H. Crouch	32	17	11	12	12	84
A. W. Goodwin (*a*) ..	29	18	12	11	11	81

* In connexion with the points allotted under "yield," it should be noted that these do not correspond with the estimated yield in bushels. The estimated yields were, in each case, higher than the figures shown.

The crops shown were all of a very high standard, and some excellent yields should have been obtained. The first prize is awarded to Messrs. Kennett Bros., whose crop consisted of the best 75 acres of an 190-acre paddock of Federation. The crop was practically true to type, even, free from disease, and with but few weeds.

It was sown on summer fallow which had been ploughed in March to a depth of 4½ inches and then left till September, when it was scarified and harrowed. It was scarified again in October and again harrowed. At the end of May 60 lbs. of seed and 90 lbs. of superphosphate were sown—one-half with the spring-toothed combination drill and the other with the ordinary drill preceded by the scarifier. Since 1917 the paddock has been in wheat, oats, grass, fallow, and wheat.

The second prize goes to Mr. A. E. Sanders, who exhibited an excellent crop of 80 acres of Federation. The crop, which promised to yield exceptionally well, was reasonably true to type, remarkably even, and, with the exception of an occasional sow thistle, free from weeds. The paddock was summer-fallowed in March to a depth of 5 inches. In July it was spring-toothed, scarified in September, and then harrowed twice before November. Towards the end of June it was scarified, sown with the ordinary drill and harrowed. Seventy pounds of seed and 100

A Heavy Crop of Federation. (Mr. A. E. Sanders.)

lbs. of superphosphate were used. The rotation practised by Mr. Sanders is either oats, fallow, wheat, or grass, fallow, wheat—the land being in either oats or grass every third year.

For third place Messrs. Crouch Bros. and Mr. A. W. Goodwin are equal with 90 points each. Messrs. Crouch Bros. showed 75 acres out of a 90-acre paddock of Federation. Although the seed has been grown on the farm for some considerable time now, it is still reasonably pure, although a few plants of barley and an occasional "stranger" were seen. The crop was fairly even, and except for a few small patches of "take-all," free from disease. There was a slight undergrowth of cockspur and ironweed and a fair number of wild oats.

The land was ploughed in July to about 4 inches. In August the paddock was spring-toothed, the other half being harrowed. The whole was then spring-toothed in September across the last working, and again spring-toothed early in November. Sixty pounds of seed and 90 lbs. of superphosphate were sown with the spring-toothed combination drill

about the second week in June. Since 1917 the paddock has been cropped as follows:—1917, wheat; 1918, oats; 1919, grass; 1920, fallow; and 1921, wheat.

Mr. A. W. Goodwin's "b" crop (grown on that part of his property known as "Boxdale") consisted of portion of an 115-acre paddock. The variety was again Federation. The crop looked exceptionally heavy, and was well headed, particularly on a portion which was sown later than the rest. There was a fair amount of "take-all" in the earlier-sown portion, mainly in crab-holes, where the land was not worked owing to the presence of water. A fair number of weeds were present. The paddock—a rich black flat—was summer fallowed in March, and during the year received nine workings. In May it was scarified and sowing was commenced towards the end of that month, but, owing to unfavorable weather, was not completed till the end of June. Sixty pounds of seed and 120 lbs. of superphosphate were used.

Messrs. Crouch Bros.' Crop of Federation.

Portion of the land was harrowed after the drill, and in August about 600 sheep were put on and left for a couple of weeks, the crop being eaten down fairly close.

Next in order of merit is the crop shown by Mr. O. A. Hendy. This consisted of a 55-acre paddock of black land with a few small red patches and crab-holes and 20 acres of more even and level black country. The crop was fairly heavy, but not uniformly so, the last portion seen being much heavier than the first portion. Twelve acres were sown with seed obtained from Longerenong College, and this was true to type, but in the remainder a few foreign varieties were seen. Points were deducted for presence of weeds, there being a considerable undergrowth of cockspur, and wild oats were numerous, except on about 35 acres which had been harrowed several days after sowing. Seeding took place in June; 63 lbs. of seed and 120 lbs. of superphosphate were sown.

Mr. A. E. Williams showed a nice crop of Federation. The seed was fairly pure and, although light on the red patches, the crop should

yield well. There was practically no undergrowth of weeds, but a number of wild oats and a few thistles could be seen. The paddock was summer-fallowed in March, harrowed in July, skim-ploughed late in September, harrowed twice during October, and scarified in November. Sixty-three pounds of seed and 90 lbs. of super. were sown during the last two weeks in June; a portion was sown with the combined drill and the remainder scarified and then sown with the ordinary drill.

Mr. R. M. Williams' crop consisted of 35 acres of Dollar and 70 acres of Federation. Both crops were very well headed and fairly even. The Dollar was true to type, but the Federation contained a few heads of other varieties. There were a fair number of weeds present. Seeding (60 lbs. of seed and 90 lbs. of super.) took place early in June—the combination drill being used.

A heavy crop was shown by Mr. R. Barber, but, unfortunately, it had gone down badly in places.

Mr. H. Crouch's crop of Federation also promised to yield well, but it was a little too rank in places and rather uneven. Some weeds were present, also a few patches of "take-all." The crop was sown about the middle of May—60 lbs. of seed and 100 lbs. of superphosphate being used.

Mr. A. W. Goodwin's (a) crop was sown on that portion of his property known as "Lackmann's." It was much lighter than the other crops seen, was slightly smutted, and showed a considerable undergrowth of weeds. The sowing of this crop was started in May, but was not completed until late in June. One-half was sown with the combined drill.

SECTION B—BEST 100 ACRES OF FALLOW 1920, AND THE CROP OF 1921.

Name	*Yield.	Trueness to Type.	Evenness.	Disease	Weeds.	Total for Crop 1921.	Total for Fallow 1920.	Grand Total.
Possible points ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
Kennett Bros. ..	34	19	14	15	13	95	89	184
A. W. Goodwin	35	17½	13	12½	12	90	85	175
Crouch Bros. ..	33	18	13½	13	12½	90	83	173
A. E. Sanders ..	35	19	15	10	14	93	80	173
H. Crouch ..	32	17	11	12	12	84	88	172
R. M. Williams	33	18½	14	10	11	86½	78	164½

* See note under Table 1 (Section A).

In this section the fallow was judged by Mr. I. M. Tulloh in 1920. The points awarded for the fallow in that year are added to the points for the crop grown on that fallow and the totals compared.

Messrs. Kennett Bros. were placed first in this section with a total of 184 points. The crop shown was the same as has already been described under Section A.

Mr. A. W. Goodwin is second with 90 points for the crop and 85 for the fallow, making a total of 175 points. This crop is the "b" crop shown by Mr. Goodwin in the first section.

The remaining crops have also been described under Section A.

SECTION C—BEST 100 ACRES OF FALLOW.

Name.	Moisture.	Mulch.	Cultivation.	Weeds.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
A. W. Goodwin (*a*)	25	21	22	24	92
S. R. Champness	25	21	23	21	90
Crouch Bros.	25	20	22	22	89
A. E. Williams	25	21	20	22	88
R. M. Williams	25	22	18	23	88
O. A. Hendy	25	21	21	20	87
Kennett Bros.	25	19	22	19	85
A. E. Sanders	25	20	17	21	83

In a normal year the amount of moisture found in the fallows is the best indication of the efficiency of the cultivation methods adopted. This

Messrs. Crouch Bros.' Well-Sheltered Homestead.

year, however, owing to the heavy rains which fell just prior to the judging, all the fallows showed a high moisture content. It was therefore possible to separate them only on such points as the character and depth of the mulch, the efficiency of the cultivation in obtaining a level, well-consolidated bottom, and the presence or absence of weeds. Mr. Goodwin's winning fallow consisted of a 60-acre paddock of well-mixed red and black land, together with 40 acres of black land from another paddock. The mulch, although a little shallow in places, was mainly about the right depth and in fair tilth. The "bottom" was well consolidated, but slightly ridged. Very few weeds were noticeable. The 60-acre paddock was summer fallowed in April, harrowed twice in August, and skim-ploughed in the same month. It was then harrowed twice in September, and in October worked with the Suntyne combination drill with harrows behind. It was harrowed early in November and again late in the same month. The remaining 40 acres were winter fallow.

A very creditable fallow was shown by Mr. Roy Champness, to whom second place is awarded. The paddock exhibited consisted of 107 acres —mainly black land, and practically on the fringe of the Mallee. Portion of the paddock was summer-fallowed in April to a depth of 5 inches, and spring-toothed in June. The balance was ploughed during June and July. The whole of the paddock was harrowed in August, spring-toothed in September, scarified late in October, and harrowed twice in November.

The remaining fallows, though generally good, lost points for such faults as shallow mulches, insufficient consolidation of the under layers, and the presence of weeds—particularly barley grass. This grass is a host for "take-all," and serves to carry the spores or seeds of the disease over from one wheat crop to the next; its eradication from the fallow should, therefore, be one of the main considerations. As sheep will not readily eat mature barley grass while other feed is about, the farmer ought to endeavour to kill this weed by cultivation before it reaches the seeding stage.

SECTION D—100 ACRES OF FALLOW 1921 AND THE CROP GROWN ON THAT FALLOW IN 1922.

Name.	Moisture.	Mulch.	Cultivation.	Weeds.	Total.
Possible points	**25**	**25**	**25**	**25**	**100**
S. R. Champness	25	21	23	21	90
Crouch Bros.	25	20	22	22	89
A. E. Williams	25	21	20	22	88
R. M. Williams	25	22	18	23	88
A. W. Goodwin (*b*)	25	19	20	23	87
O. A. Hendy	25	21	21	20	87
Kennett Bros.	25	19	22	19	85
A. E. Sanders	25	20	17	21	83

The prize in this section will be allotted after the judging of the crops grown on these fallows next year. With the exception of that shown by Mr. Goodwin, the fallows are the same as in Section C. The fallow entered by Mr. Goodwin for Section D is on that portion of his property known as "The Nook."

NOTES ON THE COMPETITIONS.

The rate of seeding favoured by most of the competitors was 60 lbs. per acre. Out of the ten crops seen, eight were seeded at this rate, while the other two were sown at the rate of 70 lbs. per acre. The amount of superphosphate applied varied from 90 to 120 lbs. per acre. In this connexion it is significant that experiments carried out at Longerenong College over the last eight years have shown that for both early and late sowing seeding at the rate of 75 lbs. per acre, with a dressing of up to 2 cwt. of super., has given the most profitable results.

TIME OF SOWING.

The time of sowing ranged from May to July, the greater portion of the crops seen being put in during June. The advantage of later

sowing was seen in Mr. Goodwin's "b" crop. In this paddock drilling was commenced towards the end of May, but owing to unfavorable weather was not finished till the end of June. The later-sown portion was considerably heavier than that sown earlier, and should yield at least one and a half bags per acre more. From experiments conducted by the Department of Agriculture in the Wimmera, it has been definitely determined that late sowing (July) is preferable to early (May and early June), giving increased yields, cleaner crops, and a decreased liability to "take-all." In an experiment carried out over four years with six different varieties of wheat the difference in favour of late sowing has averaged 4 bushels per acre.

The trouble in the Kaniva district, however, is the danger of heavy rains later in the season making it difficult to get the seed in—particularly in the crab-holey land. At the same time, many of the competitors

Mr. Roy Champness's Well-Kept Orchard and Vegetable Garden.

prefer to delay the commencement of sowing till at least after the middle of June. Where the nature of the land is such that it is essential to begin sowing early, harrowing after the crop is up is a practice that may be followed with advantage. An example of this was seen in the crop shown by Mr. O. A. Hendy. When sown in June the paddock was rather dirty, and some time after seeding Mr. Hendy ran the harrows over about 35 acres of it. This portion of the crop was practically free from weeds, while the remainder, which had not been harrowed, contained a good deal of rubbish.

"BALL SMUT."

A few of the crops seen contained a fair number of plants that were affected by "Ball Smut" or "Stinking Smut." This objectionable disease is one that can easily be kept out of the crop, providing proper methods of pickling are adopted. When the seed is pickled in the bag,

any unbroken smut balls that may be present are uninjured by the pickle. Later, usually in the drill, these smut balls become broken, and the seed is re-infected with the disease. The correct method is to immerse the seed for from 3 to 5 minutes in a pickle of bluestone, $1\frac{1}{2}$ lbs. to 10 gals., or formalin, 1 lb. to 40 gals. At the same time the seed should be well stirred, and any smut balls which rise to the surface skimmed off. The bags should also be pickled.

AN ORCHARD ON THE WHEAT FARM.

A feature of the competition was the fine orchard seen during the visit to the farm of Mr. Roy Champness. This is a striking example of what can be done in the district in the way of improving living conditions and, at the same time, beautifying the home. Ten years ago, when Mr. Champness first started on his block, there were practically no improvements at all. To-day he has a splendid farm, with a fine homestead, plantations of sugar gums, &c., and an excellent orchard. The orchard, which has an area of one acre, was planted out in 1914, and contains apples, pears, peaches, plums, apricots, figs, and grapes. These are all bearing well, and look exceedingly healthy although, with the exception of the grape vines, they have not been watered at any time. Mr. Champness, like others who have been successful in raising orchards in the wheat belt without irrigation, finds that thorough cultivation of the soil is the main essential for success.

Alongside the orchard is a vegetable garden, in which all kinds of vegetables are being successfully grown.

In conclusion, I desire to thank the competitors for their hospitality, and the president of the society, Mr. A. E. Williams, the secretary, Mr. Cordner, and Messrs. Lackmann and Curry for their assistance and co-operation during the judging of the competition.

FEEDING WHEAT TO STOCK.

Several correspondents have written to ask that, in view of the fall in price, wheat should be included in the list of feeding stuffs dealt with in the following table. It has therefore been included, and it will be seen that the price has reached a stage where it is as economical to the farmer to feed the wheat to stock as to market it for flour. It is also interesting to note that at the prices recorded in the table, both bran and middlings are more expensive to feed than wheat itself. The points to be observed in feeding wheat are familiar to most stock feeders, but it will perhaps do no harm to repeat them. (1) Wheat should be ground for all stock except sheep, since the kernels are small and hard. (2) Wheat so ground should be ground only to a very coarse meal. If ground to a fine meal, the meal pastes in the mouth and forms an unsatisfactory feeding stuff. (3) Wheat should only form a small proportion of the concentrates fed to stock, except perhaps in the case of the pig. With the horse, feeding wheat in any quantity leads to digestive disturbances and skin eruptions.—[*Journal of the Ministry of Agriculture*, England.]

WEEDS AND THEIR ERADICATION.

(Continued from page 18.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

The Artichoke Thistle, *Cynara cardunculus*, L. Asteraceæ.

This most aggressive-looking plant belongs to the same genus as the artichoke, *C. scolymus*, L., so much grown in Europe for culinary

Fig. 16.—The Artichoke Thistle, *Cynara corduncul**us*, L.

purposes. It thrives best in good strong soils, and increases very freely from seeds. The genus Cynara contains several species, most of which are natives of Southern Europe. The species, *C. cardunculus*, commonly known as False Artichoke, and sometimes by the name of Cardoon, is prevalent on the outskirts of Melbourne, and other places in Victoria. It has been proclaimed, under the Thistle Act, a noxious weed throughout the whole State. This false artichoke is a perennial, often reaching 6 feet in height, and is wide in proportion, as can be

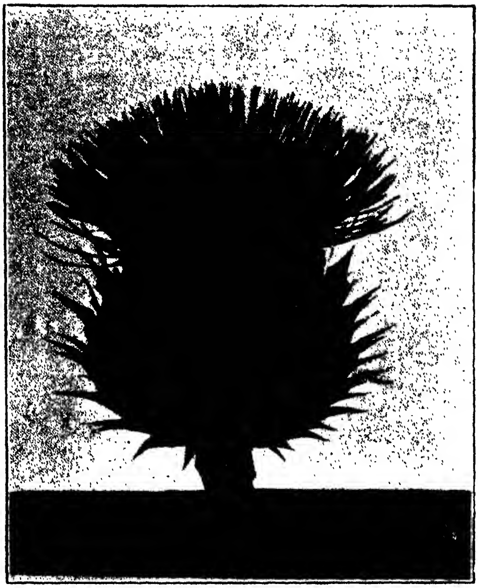


Fig. 17.—A Bloom of the Artichoke Thistle.

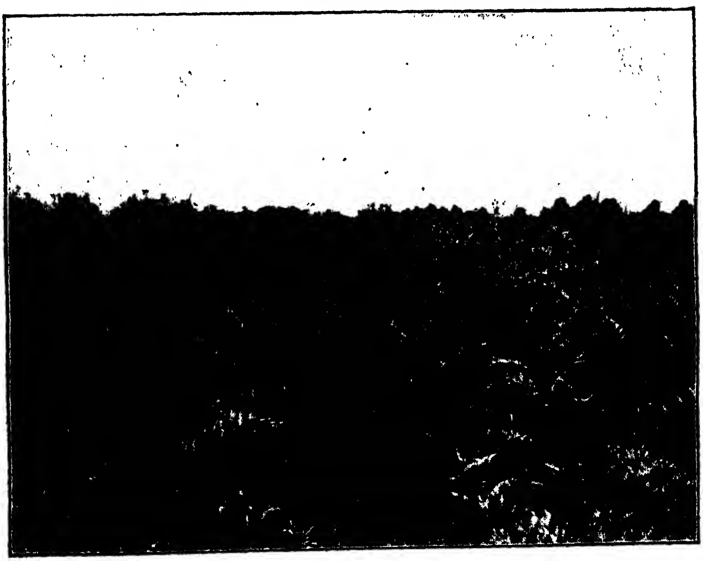


Fig. 18.—Artichoke Thistle in possession of land at Sunshine.

seen by referring to Fig. 16. Its lower leaves are very large, and pinnatisect (leaf cut into segments nearly to the midrib), the lobes of each segment ending in strong yellow spines. This plant is usually in full flower about Christmas, the flower heads are solitary, very large, and of a blue colour (Fig. 17). Many of these blossoms are forwarded to the Queen Victoria Market, arriving in trays, just before the Christmas and New Year holidays, and find a ready sale there as Giant Thistles, at from 3d. to 6d. a bloom.

Fig. 18 affords a good idea of the way in which this species takes possession when the ground is left undisturbed.

Fig. 19.—Portions of Roots of Artichoke Thistle.

Hand pulling is, of course, impracticable; first, on account of the plant's spiny character, and also to the strength of its woody roots. These are so big that it is no easy matter to dig up one of the plants, as can be judged by the sections of roots illustrated in Fig. 19.

Owing to the spreading habit of the False Artichoke's large leaves, one cannot approach close enough to dig or mattock it out, consequently these leaves have first to be removed by means of a slasher. Afterwards the plant should be grubbed completely out, in which operation a chisel-ended pick will be of great service. Sparrows and

goldfinches destroy large quantities of the seed of this plant by picking them out before they are fully ripe.

Fig. 20.—Foxglove, ***Digitalis purpurea,*** **L.**

Purple Foxglove, *Digitalis purpurea,* L. Order Scrophulariaceæ.

This plant (Fig. 20) is a native of England, where it is fairly common. It appears to favour soils deficient in lime. Although not

yet proclaimed under the provisions of the Victorian Thistle Act, undoubtedly it should be, as it is a most poisonous species, and is spreading at an alarming rate over the hills at Walhalla. It is in all probability an "escape" from one of the small abandoned gardens in the township, and during recent years has spread itself for miles over the

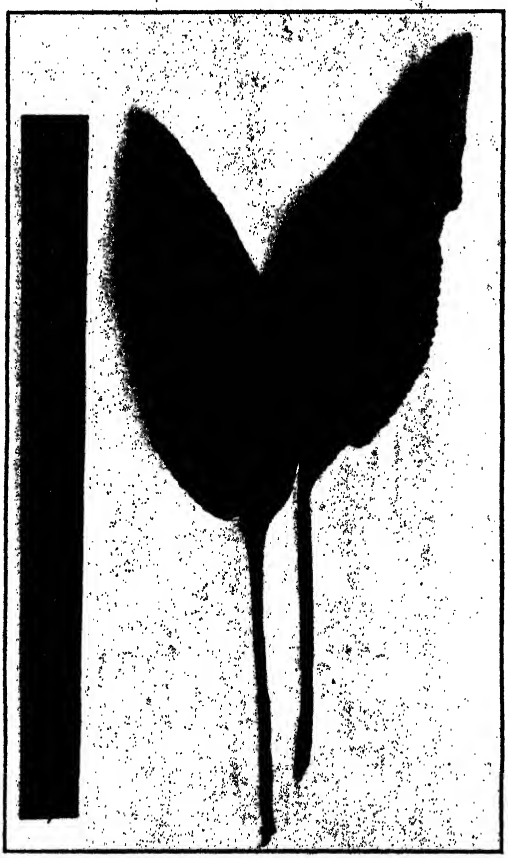


Fig. 21.—Leaves of Foxglove.

surrounding country. In early summer the flowers present a very pretty appearance there, rising tier after tier, the colours ranging from white to purple.

The foxglove appears to be free from attack either from stock or insects, and as a result of this immunity it may, in a few more years, become one of the commonest of weeds.

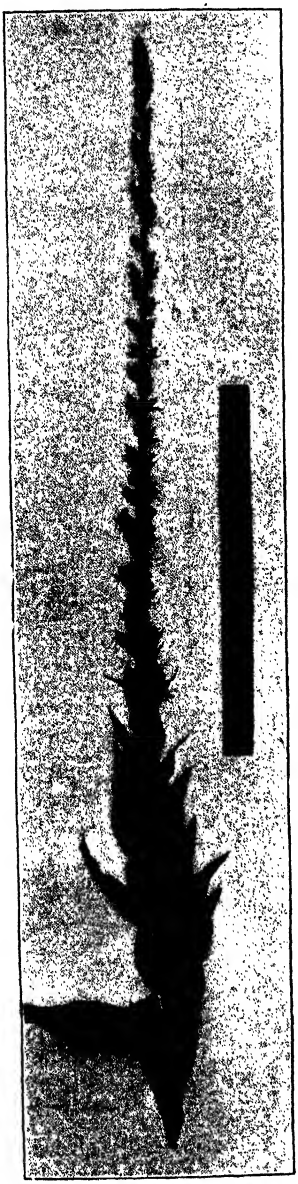


Fig. 22.—Mullein, *Verbascum Blattaria,* **L.**

Grazing animals leave the foxglove severely alone, but danger lies in the fact that where the plants become plentiful there is a risk of portion of them being included in hay or silage. All parts of the plant are poisonous, its seeds especially so, and as the toxic principle is not destroyed by drying, there would be a great risk of poisoning stock if fodder containing seeds or any part of this plant were supplied to them. Foxgloves frequently attain a height of 6 feet, and the tall stem usually bears numerous bell-shaped purple or white flowers, arranged in the form of a tapering spike or one-sided raceme. Its large wrinkled leaves are illustrated in Fig. 21. The plant is a biennial, and during its first year of growth consists of a dense rosette of leaves. These yearling plants should be hoed out; the following year these rosettes, if not interfered with, will throw up a stem whose flowers will later on produce many two-celled capsules containing numerous seeds. The plants are easily hand-pulled, after which operation they should be collected and burnt.

Twiggy Mullein or Spurious Mullein,
Verbascum Blattaria, L.
Scrophulariaceæ.

Probably about 70 species of Verbascum, mostly natives of Southern Europe, are recorded. The species *Blattaria,* which is proclaimed under the Thistle Act for the Shire of Buln Buln, and which has of recent years become exceedingly common in many other districts. It is native to England.

This plant is a vigorous-growing biennial, producing a great number of bright yellow flowers, the stamens of which are covered with purple hairs. By the end of January it has usually finished flowering, but the dry flower stems, with their clusters of seed vessels, often remain standing until the following spring. This weed favours grass lands, and in all probability its seeds are often collected with those of grasses; this has enabled it to become so widely spread.

Fig. 22 shows a flowering stem of this plant, of which Fig. 23 is a portion giving a more detailed view.

Fig. 23.—Portion of Flower Stem of V. *Blattaria*, L.

The best means of control is to hoe out the autumn rosettes or to hand-pull them later when the flower stem has arisen, but care must be taken to do this hoeing or pulling before the plant has ripened its seed.

(*To be continued.*)

THE CONTROL OF SLUGS.

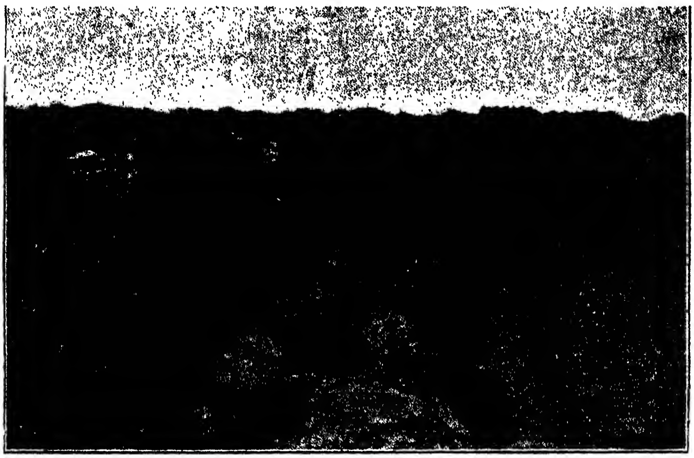
As slugs readily take advantage of all kinds of refuse for shelter in the day-time, it would seem advisable to plough in crop residues immediately after the removal of the crop, and organic manures as soon as applied. . . . This is specially important during the period when no crops are available on arable land. All vegetation on waste ground, hedge, ditch, and pond-sides should be periodically turned. Cleanliness and tidiness in stockyards, around root clamps, and in gardens should always be maintained, since all material lying about harbors slugs to a remarkable extent.—[*Journal of the Ministry of Agriculture*, London.]

RESULT OF MANURE TRIALS ON POTATOES UNDER IRRIGATION.

By J. T. Ramsay, Potato Expert.

During the past few years lucerne growers at Werribee have had to consider the problem of how to keep lucerne stands at a standard of productiveness which would prove to be profitable. It was found that after a course of about seven years continuous cutting for hay—or alternately cutting and grazing—the sole of the pastures gradually thinned so much that some method of renovation was necessary.

The simple procedure of scarifying the worn lucerne and re-seeding was tried, but proved unsatisfactory. It seemed necessary to put the



I.—Portion of Field after Digging.

(Part on left was dug by hand, that on the right was dug by machine.)

land right out of commission, as far as lucerne was concerned, for a year or two, and then lay it down afresh. A trial of cereal crops for this purpose was made with little success, as these provided no opportunity for inter-cultivation during their growth. Lack of frequent inter-cultivation merely stimulated the surviving lucerne plants to greater vigour, and they became a greater nuisance than ever. Ultimately it became obvious that some crop permitting opportunity for stirring the soil sufficiently often to kill the lucerne plants would have to be grown. The attention of growers was then focussed on root crops, and eventually the potato as being a high money-value crop was tried.

The experience of the past two years with this crop has proved that—

First—It is eminently suitable as a rotation crop with lucerne, as the high standard of tillage which it demands is the best

means of combating the tenacious grip which old lucerne roots have on the soil.

Second—The potato crop can be successfully and economically grown after lucerne on the lighter soils of the district.

Third—The crop can be grown for the early mid-season or late markets.

Fourth—The quality of the potatoes grown ranks among the highest in the State.

Lucerne is admittedly one of the best soil-improving crops which can be grown, and at Werribee an appreciable physical improvement of land which has grown lucerne for six or seven years was noticeable; while, as was to be expected, the fertility also was increased greatly. During the past year a trial was conducted by this Department to determine whether or not this physical and chemical improvement due to lucerne growing was sufficient to produce potato crops without further augmentation by artificial manuring; and, if not, what manures and quantities of same would produce the optimum result.

The manures and rates per acre tried, together with the results obtained, are shown in the following table:—

	Tns.	cwt.	qrs.
Plot I.—No manure	4	18	0
„ II.—5 cwt. superphosphate per acre ..	6	16	2
„ III.—10 cwt. superphosphate per acre ..	5	15	2
„ IV.—5 cwt. blood bone and superphosphate per acre	5	15	2
„ V.—10 cwt. blood bone and superphosphate per acre	6	16	2
„ VI.—10 cwt. basic superphosphate per acre ..	5	4	3

The crop was planted at the end of August, and harvested in the first week of January. The variety grown was confined to Carmen, but the parcel of seed was considerably mixed—a very large percentage of it being Late Carmen.

One irrigation was given—on 10th November—but from experience gained it is certain that a much increased yield would have been obtained from a second irrigation. The evidence supporting this is the fact that on one or two rows subjected to an accidental second irrigation the crop was vastly improved, and though not weighed, was estimated to go about 8 tons per acre.

The above results suggest that 5 cwt. superphosphate per acre is the most profitable dressing, but it is highly probable that with more water the heavier dressings would have scored. A fact worthy of mention and consideration is that the no-manure plot, being situated at the edge of the paddock, was somewhat influenced by seepage water from an adjoining paddock.

Notwithstanding these fluctuations in the conditions governing the area of one acre on which the tests were carried out, it remains proven that judicious manuring to supplement the improved soil condition effected by growing lucerne for a number of years is most advisable and profitable, though at the present stage it is impossible to make a definite statement as to the exact manuring which would give the best all-round result.

The fact that no second irrigation was given was due entirely to the deceptiveness of the season. Frequent light showers fell during the growing period, and these, while insufficient to supply the moisture necessary for the full development of the crop, were, in conjunction with threatening skies, quite sufficient to justify withholding irrigation. Had a second irrigation been given, and the threatened rain also fallen, the result would have been very harmful. Every credit is due to Mr. G. Barker, on whose farm the trial was conducted, for the whole-hearted manner in which he cared for the cultivation and irrigation of the field, the results from which are highly satisfactory.

A most noticeable feature of the harvesting operations was the difference between the condition of the ground harvested by hand and that harvested by the machine digger. Two of the illustrations given here demonstrate this difference very forcibly.

It is obviously impossible, without resorting to very expensive hand hoeing, to eradicate every weed plant growing in the potato rows. That being so, some of these weeds must mature.

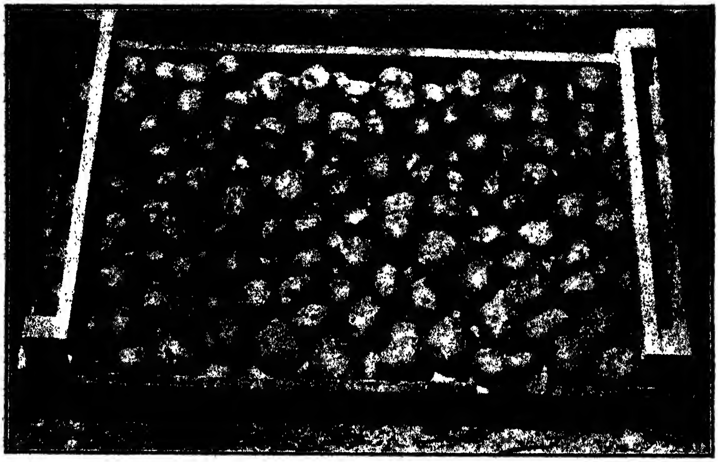
II.—Another Portion of Experimental Field.

Illustration No. I. shows an end-on view of a portion of the field after being dug. The weedy section on the left of the picture illustrates the ground as it appeared after digging by hand. The right-hand portion of the picture shows the ground as left after digging by machine. Illustration No. II. further demonstrates this difference from a broadside point of view.

It is somewhat difficult to understand why so few digging machines are used in the State. Certainly the high prices charged for them act as a deterrent on many would-be purchasers. Everything, however, is on their side with regard to cleanness of digging and lifting the tubers without damaging them, while there is absolutely no comparison in the condition in which the soil is left, the machine leaving it almost perfect.

Next season it is intended to amplify the experiment in potato growing on the irrigated country at Werribee, and the proposed scheme includes the following tests:—

I.—Further manure trials.
II.—Selected seed against the run of seed.
III.—Boxed seed against bagged or pitted seed.
IV.—Immature against ripe seed.
V.—Variations in number of irrigations given.



Seed for next Season's Tests.

An illustration is given of a box of the selected, immature seed which will be used in next season's test, from which most valuable data is expected.

Had it not been for the Australian bug which was introduced by unknown means many years ago, and which proved to be such a serious pest to citrus trees, the Union would now probably be far in advance of its present position in the citrus industry. The position seemed hopeless until American entomologists recognised the practical value of the ladybird, *Novius cardinalias*, a natural enemy of the bug in its native home. By introducing the ladybirds into California the bug was soon brought under control. On being introduced and disseminated in South Africa, largely through private enterprise, the ladybird maintained its reputation as a beneficial insect. The great benefit thus derived from America has been passed on by us to other countries during the last twenty-five years. The Divisions of Entomology has spared no efforts to meet all demands, South America having been supplied with a strong initial colony only a year ago.—[*South African Journal of Agriculture*, December, 1921.]

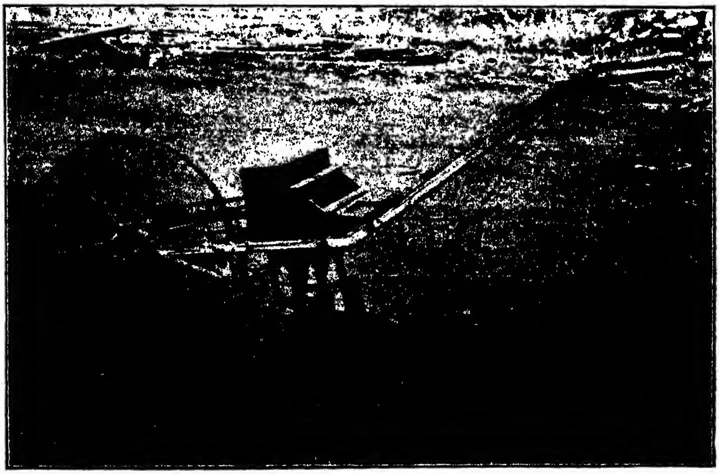
ONION PRODUCTION.

(Continued from page 9.)

By S. G. Harris, Senior Potato Inspector.

Harvesting.

The time of harvesting extends from late September or early October to March. The first onions to come on to the market are the Silverskins, from the market-garden areas of the Brighton District. They are followed by the Early Globes from the same areas. The first deliveries of Silverskins are pulled before they are ripe, and the tops cut off while the necks are quite thick, the growers being anxious to catch the early season high prices. These, however, are only fit for immediate use, and are marketed in cases and half-cases in small quantities. Being only half ripe they contain a large percentage of moisture, and, if bagged, will very quickly heat and become useless.



An Onion Seeder.

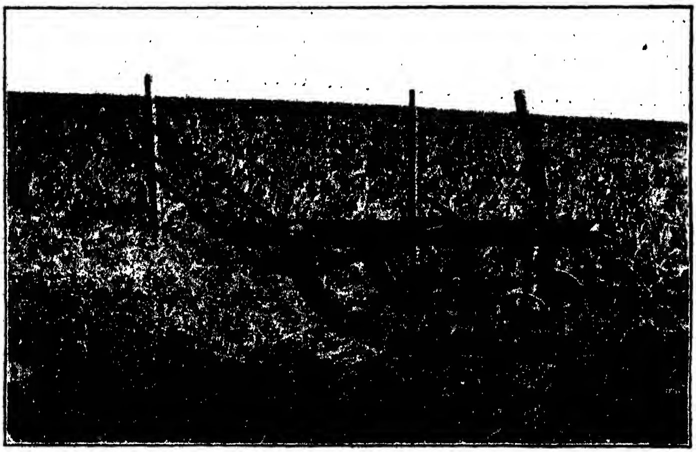
As the season progresses, and the bulbs ripen, they are quite a useful early export onion (especially in seasons when the supply of late onions is limited), to carry on until the Early Globe is ready to fill export orders. The Early Globe is usually fit for sale about the second or third week in October, and holds the market until the Late Globes come in late in January or the beginning of February, to be followed by the main crop of Brown Victorian, in March.

In the market-garden areas and small plots the harvesting is mostly done by hand-pulling, and in the larger areas by skimming. The time of harvesting onions varies to a certain extent among growers.

The general practice is to allow the crop to remain in the ground until the tops have bent over by their own weight and begin to yellow and wither.

Onions should not be allowed to become too ripe before harvesting as they have a tendency to take root again, especially if the season is

wet. In some instances the plants ripen irregularly, and it may be necessary to break them down with a light roller. This may also be necessary in the case of a late crop to hasten ripening, and allow the bulbs to be harvested while favorable weather conditions prevail. There is, however, no advantage than that mentioned in thus forcing ripening. The old idea that by thus breaking down the tops, the sap will be restricted, and the bulbs increased in size has been proved to be without foundation. At the proper period the stem will bend naturally, and so restrict the sap and keep it in the bulb. This is the accepted view of our best and oldest growers, but some growers in America advocate harvesting the bulbs on the green side; in fact, as soon as they have attained full size, as they contend that crops harvested under these conditions will retain their outer skins, very seldom develop roots in storage, and with curing become solid bulbs of excellent colour.



Skimmer.

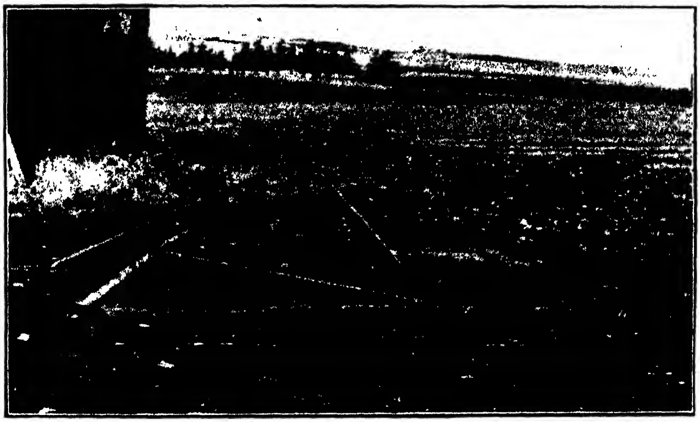
Except where small areas are planted the skimmer is used to remove the crop from the soil. It consists of two blades about 30 inches long; these blades must be set perfectly level and are placed on an angle of about 60 degrees from each other, and cut on a back slope. They work parallel to the surface of the soil, and can be regulated to cut to any depth required for the removal of the onion bulb. The usual practice is to set them just deep enough to pass under the bulbs, and so shallow that they will disturb only sufficient soil to leave the bulbs in a clean row on the surface behind the machine. After the skimmer has removed the crop the onions are raked into rows with a hand rake or by an implement known as a triangle. A skimmer having two 30-inch blades will take three rows at a stroke, and on an average from 2½ to 3 acres may be skimmed in a day. It may also be utilized for weeding and cultivating.

A triangle will, at each sweep, make five skimmed rows into one, and these are then left on the ground for several days to cure, but should not be left too long lest they become dry, when the outer skin

will harden and peel off, and the market value of the crop be very materially decreased. The grower will be guided by the condition of the crop when skimmed, and the weather prevailing during the curing period as to the length of time that the crop shall remain in the rows.

When the curing process is complete a heavy set of harrows should be put over the rows on a hot day, and all loose leaves and tops removed. A fast-walking horse should be used, as the faster the horse travels the better will the work be done. This completes the harvesting operations, and the bulbs may now be graded, stripped, and bagged for market, or stored for future use.

Seed is harvested by hand into a bran bag, carried in front of the operator by means of a strap or cord passed over the shoulders. This allows the free use of the hands for cutting. The seed-heads should be cut when the seed is still firmly held in the husks. These are allowed to dry for two or three weeks, and are then ready for thrashing out with a flail, or by rolling the bags on the ground. When the seed has



Triangle.

been thoroughly thrashed out, it is cleaned by means of an ordinary farm No. 1 winnower, to which a special onion seed riddle has been fitted.

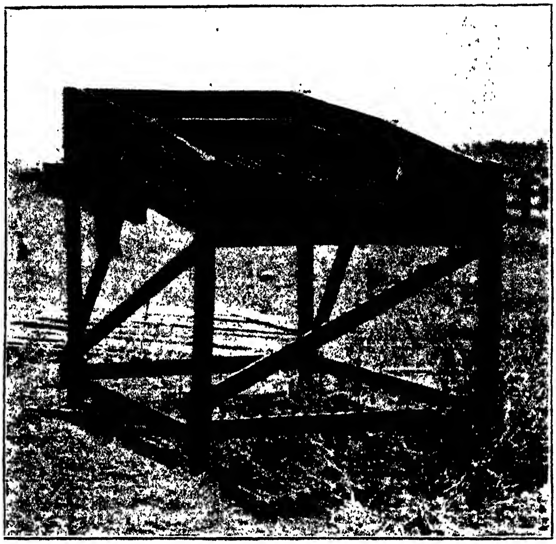
Topping, Stripping, and Grading.

In Australia the topping, stripping, and grading are all done by hand. The operator handles each onion and twists the top off close to the neck, removes all loose skins, and pulls off the long roots at the bottom. The onions are graded into two samples, known as "table" onions and "picklers." These grades are fixed by regulations under the *Fruit Act* 1917, No. 2919, and are as follow:—Table onions consist of all bulbs above $1\frac{1}{2}$ inches in diameter, and picklers all bulbs of $1\frac{1}{2}$ inch diameter or under.

Growers should be careful when grading to see that these regulations are complied with, as all onions are examined by an officer of the Department of Agriculture before they are placed on the market, and

no picklers are allowed to be marketed in the same containers as table onions. Thus it often happens that a grower, through careless grading at the farm, will have his consignment rejected when delivered at the railway siding or market, and he is put to the expense and trouble of re-grading the whole lot. It is better to err on the side of being a bit above the standard size than below when grading table onions.

The reverse applies to grading for "picklers," as it is then better to be a shade below the standard size, and the grower will find that it will pay to discard altogether a few pounds, or even a hundredweight, to the ton when grading than to spoil both of his samples by putting every bulb into one grade or the other. A badly-graded lot is only accepted by buyers under protest, and at a greatly reduced market value.



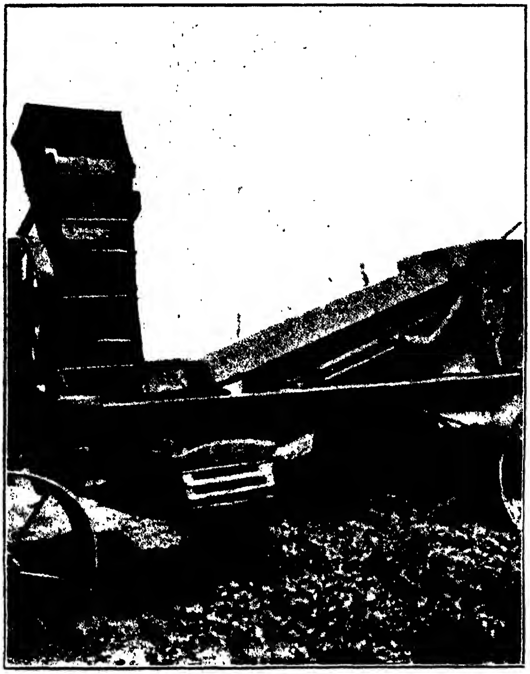
Screen for Grading Onions.

On page 95 is shown an illustration of an onion-topping machine used by many of the larger growers in the Connecticut Valley (U.S.A.). After the onions have been skinned and cured by drying for a few days in the field they are forked up and carted loose to the machine to be topped and stripped. The machine has a capacity for handling from 15 to 20 tons per day. The Bulletin, from which the illustration is taken, does not mention the cost of the machine, and reference is made to it here only for the information of growers who may deem it advisable to make further inquiry as to the relative cost of mechanical and hand treatment of the bulbs. The shortage of labour and high-wage cost makes it expedient for the producer in every avenue of industry to turn his mind to the use of machinery to perform many of the operations previously performed by hand, on the farm as well as in the factory.

Storage.

The bulk of the onion crop, which is harvested during January, February and March, is held over in storage by the grower for sale at periods when the market conditions appear most favorable, and the methods of storage are, as a rule, of the crudest description.

The onions having been stripped, graded, and filled into bags in the field, are carted and stacked in the bags on a few slabs or rails in the open, and a few loads of straw are then placed on top of the stack. In many cases this straw covering is again covered with a roof of



Onion Topping Machine.

Capacity from 600 to 1,000 bushels per day. The elevator which carries the topped onions into the bags is lowered to horizontal position when the machine is at work.

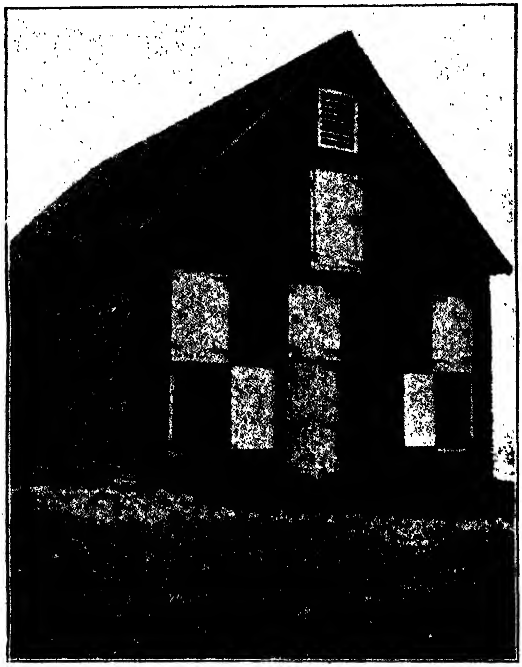
(Reproduced from Bulletin 169, Massachusetts (U.S.A.) Agricultural Experimental Station.)

iron or shingles, and while this is a protection against the entry of rain through the straw to the onions below they are still liable to damage owing to the sides and ends being left exposed to the weather. This exposure is necessary to allow a current of air to pass around and through the stack, otherwise the bulbs will very quickly begin to grow, or would sweat and rot. The ventilation of the stack by this means, however, defeats, to a very large extent, the object in view.

Onions should be kept in a dry, well-ventilated atmosphere, because, when exposed, as they are in the open field, they absorb a good deal

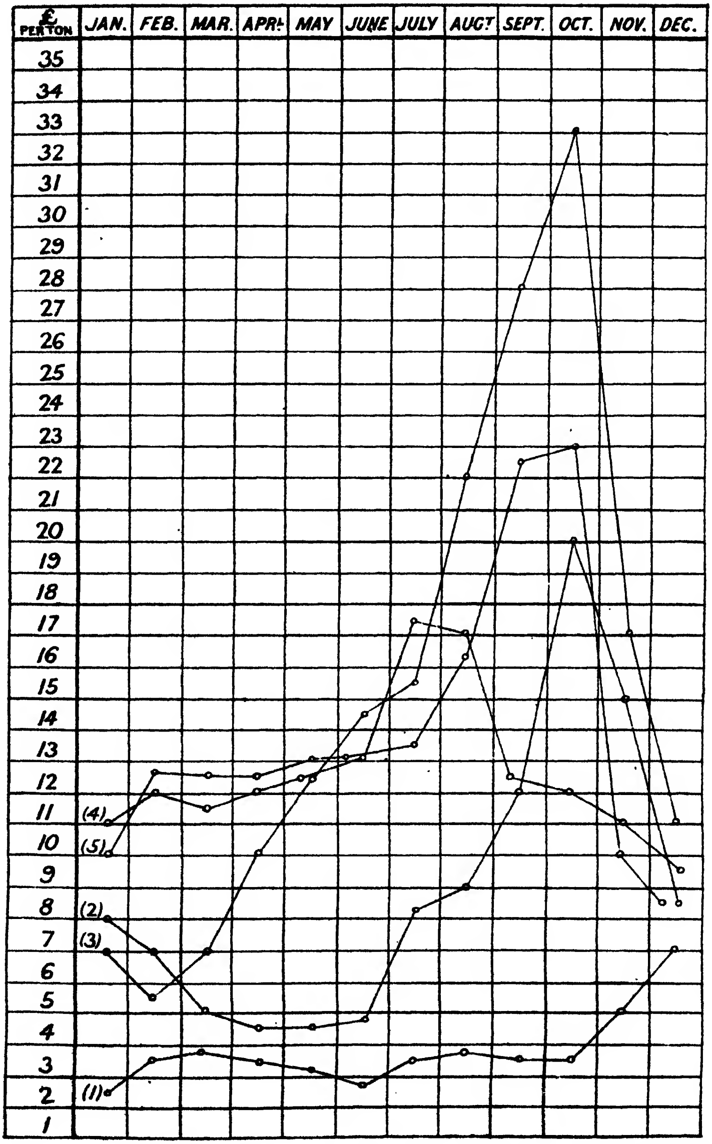
of moisture, and all too quickly begin to develop white roots and sprouts. The percentage of bulbs lost each year, through exposure, would, in a very short period, pay the cost of erecting a proper storage shed. There is also a very serious annual loss to growers through the bags, thus exposed, becoming weather-stained and rotten, and altogether unfit for the export trade, or even for transport within the State. These bags must be replaced by sound ones, and whether this is done by the grower before delivery or afterwards by the merchant the cost will ultimately, directly or indirectly, be paid by the grower.

Of late years gunny-bags, which are used for the transport and storage of onions, have been at times very difficult to procure. Yet



A Good Type of Farm Storage.
(Reproduced from Bulletin 169 of the Massachusetts Experimental Station.)

thousands of these bags have been taken from the bale new, and, through exposure and careless storage have been rendered valueless in a few months, when by care they might have been used, even for the export trade, for at least two years, for a good gunny-bag, well preserved and clean, is quite fit for export a second time. Victoria is practically the only State in the Commonwealth which grows onions for export, and these second-hand gunny-bags come back to us empty from the importing States in thousands every year, but, unfortunately, they are often fit only for local transit, and the export trade has to be met with fresh supplies of high-priced new bags, which is a further serious tax on the industry.



Average monthly value of despatch of Prime Qualities, from Spencer Street, Melbourne.

(1) 1916. (2) 1917. (3) 1918. (4) 1919. (5) 1920.

In America only onions intended for early sale are stored in bags, and the American system of storage is commended to the serious consideration of our growers. The erection of a storage shed or barn is necessary. This need not be an expensive building, but must be moisture-proof and well ventilated. When stripping and grading the onions in the field they are filled into crates instead of bags. The sides and bottom of the crate are made of slats, and each crate holds about 1 cwt. A space of about 1 inch between each slat allows free ventilation. The corners should be hardwood, not less than 3 inches by 3 inches, and raised about 1 inch above the sides. The crates may be stacked one on the other in the shed, and should be filled barely to the level of the sides, so that a space of at least 2 inches will separate the onions in the bottom crate from those in the one above, thus giving free ventilation between each row of crates. The crates may be stacked as high as convenience and the sides of the shed permit.

A Good Onion Crop (10½ tons per acre). Grown by Mr. A. Burns, Corunnun.

Experience has proved that onions stored in this way lose far less through shrinkage, and the loss through sprouting and rotting is infinitesimal when compared with what takes place under the present system of storage. A further advantage is that the grower will bag his onions only when ready to deliver, and his bags will be bright, sound, and clean, and fit for any purpose, whether required for local use or export.

If the initial cost of crates proves beyond the reach of the smaller grower, a cheaper method will be found in shelves on either side of the shed. Wire netting should be stretched tightly across each shelf to form a bottom, and battened at a height of about a foot above each shelf. The onions may be spread on the netting to a depth of 9 or 10 inches. The shelves should be built one above the other to the full height of the sides of the storage shed. This method will, however, add to the cost of handling when re-bagging. The crates will cost, approximately, about 2s. each, and, with average care, will last from twelve to fifteen years.

Marketing.

A farmer either sells his onions to the buyers and agents at his local railway siding or forwards them to agents in the larger centres of population for sale on commission. In very few instances does he come into direct contact with the consumer, the result being that the price paid by the consumer is often double that paid to the producer.

It is not the purpose of this article to propose any scheme by which the producer and consumer may be brought into closer contact, but it surely should be possible for a comprehensive co-operative system to be evolved which would preclude the present necessity of passing the produce through the hands of two, three, or more middlemen, and while giving a better return to the grower, at the same time reduce the cost very materially to the consumer.

To hold the trade under present conditions, however, is the first care of the grower. To do this he will need to put his product on the market in a condition that will be satisfactory to the buyer and reflect credit on the industry.

On the Way to Market.

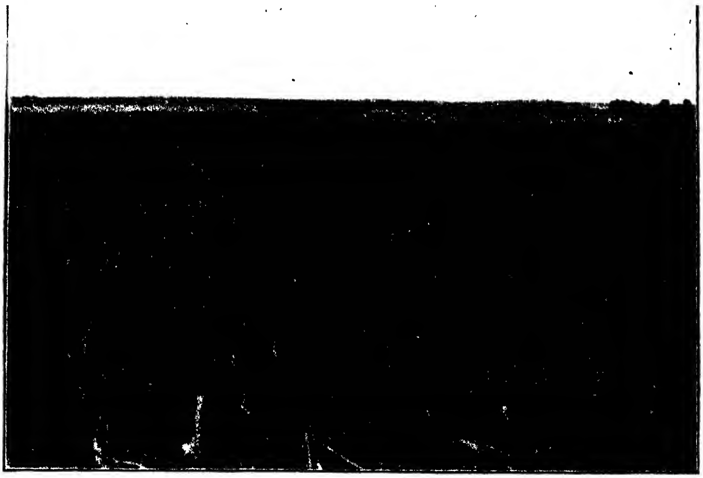
Though about five-sixths of the onions now produced in the Commonwealth are grown in Victoria, it must not be forgotten that other States are giving more attention to supplying their own requirements, and that each year the competition for the markets everywhere is becoming more keen.

It cannot be denied that complaints are all too frequent regarding the manner in which our produce is marketed. The question of grading has already been referred to, but it must be here mentioned again in respect to marketing. It is an altogether wrong idea that it is good business on the part of the grower to dispose of his entire crop at the highest price obtainable, irrespective of the quality of the onions. The growers' best interests will be served when all strive to put on the market an article of the highest quality, and in such a way as to command the admiration of buyers, whether local or oversea.

Containers.

Too little attention is paid by the grower to the question of bags for marketing his onions. His main idea is cheapness, and for the sake of saving from 2s. 6d. to 5s. per ton in the cost of bags, he frequently sacrifices from 10s. to £1 per ton on his produce. The linseed bags, so much in use during the war period, are altogether unsuitable for onions. Although they may be unbroken when delivered at the local railway siding, they are not strong enough to stand the many handlings to which they are subjected in railway and oversea transit. Onions forwarded in these very frequently arrive in bulk, even when only forwarded by rail from country sidings to the city and inland towns.

The only suitable bag is the new, or once used, gunny. It should be clean and sound, and legibly branded with the grower's name and



On the farm of Mr. G. Read, Nalangil.

address, or his registered mark, well filled but allowing for the mouth to be drawn up tightly when sewing.

The grower who takes a pride in placing his goods on the market well graded, in good bags, nicely branded and sewn, will find a ready sale for his produce at all times, even in seasons of glut and low prices, when carelessly-packed consignments are practically unsaleable.

Diseases.

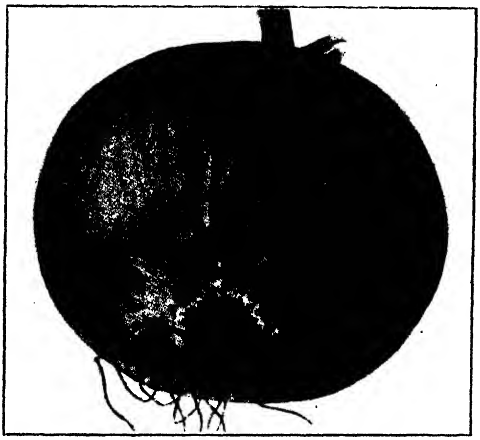
Fortunately, there are very few onion diseases of a serious nature in Victoria.

Grey Mould (*Botrytis cinerea*).

This disease, commonly known as "Root rot," is by far the worst. The disease does not attack the growing plant, but under favorable conditions develops quickly in the bulbs after skimming, either in

storage. or in transit. It usually attacks the bulb at the neck under the outer layers of skin; the diseased part becomes watery, quickly rots away, and becomes covered with a grey felt-like mould. This mould follows the scales down to the root where the outer skins are thinner, and there it will break out, while very frequently the neck still presents the appearance of a healthy bulb. When once the disease is well established, the bulbs rot very quickly if stored in close, damp atmosphere.

When harvesting, great care should be taken to prevent the onions becoming wet before storage. Should this happen, however, they should never be bagged or stored until an opportunity has permitted them to be thoroughly dried by being spread out thinly during a reasonably hot day. When dry, the bulbs should then be gathered as speedily as possible, and placed in cool, dry, well-ventilated storage. The grey mouldy growth on the rotted scales consists chiefly of the



Bulb affected with Grey Mould.

spores of the fungi, which are easily spread by air currents. They are thus carried to the healthy bulbs, where they germinate and send fungous threads into the necks of the bulbs, or attack them in any part where they have been wounded.

If the diseased part of the bulb is closely examined, numerous small black specks will be discovered. These small black bodies, or sclerotia, are compact masses of fungous threads, which, being resistant to drought and cold, serve to carry the organisms over winter, and lie dormant in the soil until the following season, or until they find a host plant.

When the disease is discovered in the stored onions, all affected bulbs should be removed, and either burnt or buried deeply, and all loose skins should be carefully gathered and burnt. Fields found to be productive of diseased crops should be thrown out of cultivation for onions for several years. The disease has made very rapid progress in

the older onion areas during the past few years, and unless care is exercised to control and check it, these lands must soon become valueless for the production of onions.

Onion Mildew.

Note the fungous growth on the dying lower leaves; the two youngest leaves are still healthy.

[Reproduced from Bulletin 1060 of the United States Dept. of Agriculture.

ONION MILDEW (*Perenospora schleideni*, Ung.).

This disease usually shows first as pale spots or blotches on the leaves. The spots, which occur mostly in the upper part of the leaf, gradually increase in size until they merge into one over the whole leaf and cause it to wither up. If the spots are carefully examined,

they will be found to be covered with a greyish-white powder, which later changes to a dingy violet.

In contrast to the smooth surface of the healthy leaf, the pale blotches caused by the fungus will be found to be rough to the touch, a character which serves to distinguish mildew from injury due to other agencies. It is on this roughened part of the leaf that the live spores are produced.

A second form of spore is formed on the *inside* of the decaying leaf. These provide for the re-appearance of the disease the following season, and by falling down to the ground with the dead leaves, thoroughly infect the soil. If buried, they retain their vitality for several years, but when brought to the surface they germinate, and if onions happen to be present they bring about their infection (*vide* Board of Agriculture and Fisheries Leaflet No. 178).

Like Irish Blight in the potato, damp, muggy weather conditions greatly favour the spread of the disease, but a spell of bright, dry days will check it; and should no more suitable weather occur, the crop, though attacked, may escape damage to any great extent.

Control methods are:—

1. Spraying with Bordeaux mixture (6 lbs. quicklime, 4 lbs. bluestone, 50 gallons of water) is effective; but the onion leaf, being very smooth, does not lend itself to control by spraying, as it is difficult to get the solution to adhere.
2. Dusting with the following:—Flowers of sulphur, black sulphur, or a mixture of powdered lime and sulphur (one part of lime to two of sulphur). The powder may be applied by a bellows, or sprinkled on the leaf. This should be done while the plants are wet with dew.
3. As the disease usually spreads, in the first instance, from one or more centres, it is important that the individual diseased plants should be discovered, and immediately removed and burnt.
4. As the new attack each season is due to the resting spores present in the soil, it is necessary, for the control of the disease, that all affected leaves and tops should be carefully gathered and burnt.
5. Where the disease is prevalent, onion culture should cease for at least three or four years, and the ground utilized for a rotation of other crops.

Insect Pests.

The principal insect pests attacking the onion in Victoria are Cut-worm, Thrips, Rutherglen Bug; Jassids or Canary Fly.

CUT-WORMS.

The Cut-worm is a brown grub about 2 inches long, which hides during the day beneath the surface of the soil or under *débris*, and

comes out at night to feed. The moth is brownish in colour, and measures about 2 inches across the wings. It usually appears about November, and successive broods are developed every few weeks until the beginning of March. The grub attacks the young onion plant at the collar (*i.e.*, just above the ground level), and eats it through, causing the young plant to fall, completely destroying it.

Treatment:—Mix 10 lbs. of bran, 4 lbs. of molasses, and 4 ozs. Paris green into a paste or dough, and divide it into small pieces about the size of a small nut, and place them amongst the crop. These are greedily eaten by the cut-worms, which are thus destroyed in large numbers. The baits are no longer acceptable to the grub once they are dry, and as they will dry up very quickly if the weather is hot, they should not be put out in the field till after sunset.

THRIPS.

The Thrips are minute insects appearing as soon as the warm weather approaches. They deposit their eggs in the flowers of onions in the seed plot, and in a few days the eggs hatch, and the young Thrips commence to suck the sap from the flower, causing them to turn brown and drop off. They also attack the foliage, turning it to a silvery colour at first; later, it becomes brown, and shrivels up.

Treatment:—Deterrent spray—Benzole emulsion 1 lb., to 5 gallons of water. Phenyle spray—1 quart of phenyle, 3 lbs. washing soda, 1 bar yellow soap, 40 gallons of water. To prepare, the soap is shredded and dissolved in hot water, the other ingredients are added, and the mixture made up to 40 gallons. Tobacco-water—Steep 1 lb. of tobacco in 1 gallon of hot water, and allow to soak for 24 hours; boil 1 lb. of soap in 1 gallon of water until dissolved; strain the tobacco-water into the soap-water, stir well, and make up to 5 or 6 gallons—use waste stems of tobacco.

RUTHERGLEN BUG.

This is one of the most destructive plant bugs appearing in the hot weather. The insects are grey in colour, somewhat resembling the ordinary fly, but much smaller. Like all plant bugs, they are furnished with a sucking beak, which they insert into the plant and extract the sap, causing them to wilt and die.

Treatment:—Same as for Thrips.

Jassids, or Canary Flies, are very small yellowish-green insects, about the size of a pin's head, appearing from September to March. They attack the plants in myriads, and cause them to wilt and die.

Treatment:—Same as for Rutherglen Bug and Thrips.

The Onion Eel-worm, which swept through practically the whole of the Portarlington onion areas some years ago, and caused a practical cessation of onion production there, has been fully dealt with in an article by Mr. W. Laidlaw, B.Sc., appearing in "Potato Diseases in Australia" (McAlpine).

Fortunately, it has not made any appearance of a serious nature in the other onion districts, and with care it should be possible to restrict it to its present areas.

TOBACCO FOR VICTORIANS.

HARVESTING BRIGHT TOBACCO.

By Max Valentine, Field Officer.

When raising a crop of tobacco the objective is to secure the greatest number of sound leaves, uniform in colour, quality, and size. The curing process is the crucial operation of the season, and every care must be taken to facilitate it. In order to obtain an even cure from each successive barn, it will be readily seen that the tobacco must all be harvested while in one condition and handled systematically. There are several essential rules which must be adhered to if this is to be accomplished. The first thing is to harvest the leaves at the right state of maturity.

As Bright tobacco ripens the leaves begin to droop, feel gummy to the touch, and the upper surface becomes slightly cockled and mottled with yellowish spots. It is then in proper condition to be harvested. If the tips of the leaves turn bright yellow and brown spots rapidly spread over the surface, it is a sign that the leaf is beginning to waste and should be dealt with immediately.

The time of this ripening period varies according to the season, but it is generally about six or eight weeks after topping. All the plants will not mature together, usually about 25 per cent. being ready at one time, which extends the harvesting over four or five weeks.

With a high-priced crop such as tobacco, all waste should be avoided. The plants should be carefully handled while being cut and hauled to the barn, care being taken not to rub or tread on the leaves. A bruised leaf will cure imperfectly. All sound leaves which fall about the field will warrant being collected.

Tobacco should not be harvested immediately after rain, as a large percentage of the gum substance, which gives the leaf quality, will have been washed out. Neither should it be handled early in the morning when dew-laden, for the same reason, and also because the plant will be brittle and because sand and dirt will adhere to the leaves.

Sufficient leaf should be harvested in one day to fill the barn, and it is essential that the fires be started in the furnaces on the same day. This point can hardly be emphasized enough, as it is a bad but common practice among growers to take two or more days to fill a barn. If this be done, the leaf which is first cut will begin to air-cure while hanging in the barn, and so be ahead of that which is cut later, making an even cure impossible. Therefore, it is advisable to have several small barns in preference to a few large ones, especially if it is doubtful whether a large gang of workers can be secured at the desired time.

There are two distinct methods of harvesting Bright tobacco which have developed as a result of the fact that all the leaves on a plant do not ripen at one time. In the one system the whole plant is harvested on the stalk when the majority of the leaves are mature, while the second system consists of priming off each leaf separately as it becomes ripe.

Both systems have their advantages, but generally the returns will be greater when priming is practised, and this method is being adopted in the most successful tobacco-raising districts.

The Single-leaf Method.

This system requires somewhat more labour in the field than the cutting method.

Each picker works down the field between two rows and plucks the ripe leaves from the plants on either hand. A low single-horse trolley or sledge, with hessian or canvas sides, sufficiently narrow to pass down the rows without breaking the plants, keeps abreast with the pickers. Each handful of leaves is placed in the conveyance with the butts all one way, to facilitate easy handling afterwards. The filled trolley is emptied in a shady spot near the barn, where further workers hang the leaves on sticks.

The standard length of these sticks is 4 feet, each carrying about fifty leaves bunched together in lots of three or four, which, looped on a fine string fastened to both ends of the stick, hang alternately on either side.

This work may be easily done by girls or boys. The loaded sticks are hung in the barn about 8 inches apart.

It has been proved that the yield of leaf harvested in this manner under normal conditions is 20 per cent. to 25 per cent. greater than when the whole plant is cut in one operation. This is largely due to the fact that a number of the unripe and small leaves at the top, which would necessarily be sacrificed were the plant cut on the stalk, are given time to further develop and mature. Also, fewer leaves will be bruised and damaged in handling. Other things being equal, primed leaves will be found heavier and of better texture than those cured on the stalk.

When tobacco harvested by the single-leaf method is being cured, the operation of drying out the heavy stalks is eliminated, thereby completing the operation some twenty-four hours earlier and offsetting the additional cost of harvesting. Furthermore, it is estimated that a barn with a capacity for curing 3 acres of cut tobacco would be able to accommodate 5 acres of primed leaf. This conservation of space also occurs in the pack-house, and further time will be saved when it comes to grading. The stalks which are left in the field, if turned under, are valuable to the soil.

The Whole-plant Method.

If it is intended to harvest under the whole-plant method, the 4-ft. hanging sticks should be distributed over the field beforehand. They should be dropped roughly end to end in every fourth row so as to provide a sufficient number for a good heavy crop.

Each cutter or pair of cutters should be accompanied by a smart boy carrying a hanging stick in a horizontal position, so that the cutter can place on it each plant as it is cut. The boy should keep abreast of the cutter, and space from eight to ten plants evenly on each stick, laying the loaded sticks in one row with the butts all one way.

The tobacco should be allowed to lie for a while in the rows until it is sufficiently wilted to permit of further handling without breakage, and then be hauled in a waggon to the barn and hung on the tiers about 8 inches apart.

For cutting, a sharp tobacco knife is used. The stalk of the plant is split from the top to within about 6 inches of the butt and then cut

off the ground. If the cutter allows his left hand to follow the knife down the cleft he will so open the ends of the stalk as to enable him to pass the plant straight on to the hanging stick with a minimum of action.

Harvesting by the whole-plant method is quicker than priming, and so can be used to advantage in the event of a late crop in a cold district, when it is necessary to house the tobacco before frosts can damage it.

A quick cutter, with a smart boy assisting, should be able to cut from 450 to 500 sticks a day.

Some growers successfully combine both methods of harvesting by priming the early lower leaves and later cutting the remainder of the plant.

Whatever system be used, it must be borne in mind that proper harvesting is half the battle in securing a good cure.

(A further article "Curing Bright Tobacco," will be published next month.)

MILK MAKES SOUND TEETH.

Dr. Percy Howe, at the head of research work in the Forsyth Dental Infirmary, Boston, Mass., where the teeth of nearly 100,000 children are examined annually and treated, states: "The mineral salts and vitamines found in milk and certain leafy vegetables are indispensable to sound teeth in children."

Dr. Howe has demonstrated this beyond question by experimental research.

Dr. Harriet Fulmer, in charge of social service work in Cook County, Illinois, reports that fully 85 per cent. of the school children have defective teeth. She states that if these children had used plenty of milk, more than 50 per cent. of them would not have had this trouble with their teeth.

Dietary scientists and food authorities state that no single food is as valuable as milk in developing and maintaining sound teeth. If these mineral salts and vitamines found in milk are not supplied to growing children in abundance—and this can be done only by the liberal use of milk—the jaw-bones, which are the framework supporting the teeth, do not develop properly and the teeth themselves protrude without proper support and are imperfect in character, irregular in shape, soft and porous, and begin early to decay.

Once this defective frame and deterioration in teeth begins, as it always does in the absence of the food elements necessary to build and maintain them, the child has started on a career of ill-health, and his future life is impaired and seriously affected.

Parents are apt not to realize the vital relationship between sound, well-placed teeth and good health. Imperfectly masticated food impairs the digestive organs, interferes with proper assimilation of food, and thus directly impairs both growth and health.

MILLET.

(Compiled by Field Branch, Department of Agriculture.)

The name "millet" is applied to a large number of cultivated annual grasses belonging to the genus *Panicum* or closely allied genera. These grasses are grown mainly as forage crops, but in Africa, India, China, and Russia they are planted extensively for their grain, which is used as a human food, either as a substitute for rice or, after being ground, as a porridge.

In this country the millets are used principally for—(1) early summer grazing; (2) green feed for stock throughout the summer; (3) to supplement the hay supply of the farm; or (4) to occupy land which would otherwise be idle on account of the failure of a regular crop, or because climatic or other conditions have prevented the seeding of such a crop. In these latter circumstances millets are, owing to their short season of growth, especially suitable.

Varieties.

The principal millets may be divided into four groups:—

1. Foxtail Millets (*Setaria italica*)—including the varieties Common, German, Italian, Hungarian, Siberian, Manchurian, Dakota, Golden Wonder, &c. The seeds of these millets are closely compacted into a club head varying a good deal in size and either cylindrical or tapering at one or both ends. The foxtail millets are of rather general adaptation as to climate and are more likely to succeed in the drier parts of the State than Japanese or Pearl millets.

2. Panicum or Broom Corn Millets (*Panicum miliaceum*)—including the varieties Russian, White French, Red French, &c. These millets are commonly known as the Broom Corn millets, since the head or panicle bears a close resemblance to Broom Corn. These varieties are the main ones used for the production of bird seed. They are also useful in the early stages for grazing, but do not make good hay.

3. Barnyard Millets (*Echinochloa frumentacea*)—the principal variety of which is the Japanese. This is a most palatable grass and readily eaten by stock at all stages up to flowering, after which it rapidly diminishes in succulence and palatability. It makes excellent hay or ensilage. Where intended for grazing purposes it should be stocked when about 6 inches high, and fed down to a height of about 3 inches. This will tend to make it stool out and become thicker. The stock should then be taken off, and if irrigation water is available it should be applied. As soon as sufficiently dry, the land should be harrowed across the drills. The stock can be put on again when the crop is 6 to 10 inches high.

4. Pearl Millets (*Pennisetum glaucum*).—This variety is known under various names, such as Penicillaria, cat-tail millet, Eygptian millet, &c. It is a tall, coarse grass and bears its seeds in a compact, slender cylindrical head or spike from 6 to 14 inches long. It is very succulent when young, but rapidly becomes woody at time of heading, so that, if intended for hay, it should be cut early. It is apparently most useful for pasturing or soiling, and on rich land furnishes several cuttings in a season. For this latter purpose it should be cut when from 3 to 4 feet high.

Climate and Soil.

Millet is adapted to a wide range of soil and climate. Although large yields are not obtained on poor soils or in dry climates, it has been found to give a heavier yield under such conditions than most other hay crops. For best results, millet must have warm weather during the growing season, and is therefore not likely to do well in high altitudes or in districts where cool weather prevails during the summer months. It naturally does best in regions which have a fairly abundant summer rainfall or where irrigation water is available. All millets thrive on a warm, open, fertile soil. Heavy land requires to be particularly well worked to produce a successful crop. Good drainage is essential if best results are to be obtained.

Millet is comparatively drought-resistant, but in this respect is inferior to Sudan grass and other sorghums. Of the millets grown in Victoria, Hungarian is probably the most drought-resistant. The Japanese millet requires much more moisture than those of the other groups, and is especially adapted to the moister parts of the State and districts where it can be grown under irrigation.

Preparation of the Seed Bed.

Owing to the small size of the seed it is essential that the preparation of the land should be such as to leave a finely-divided and well-consolidated seed bed. With light soils a rolling before seeding should be beneficial. When used as a catch crop after some early maturing crop has been harvested, it is not always expedient to go to so much trouble in preparing the land. In such case fair results may be obtained by sowing the seed on the freshly ploughed stubble. If the soil is loose and mellow, the stubble may be disced or gone over with a cultivator to kill any weeds, harrowed, and the seed sown and harrowed in.

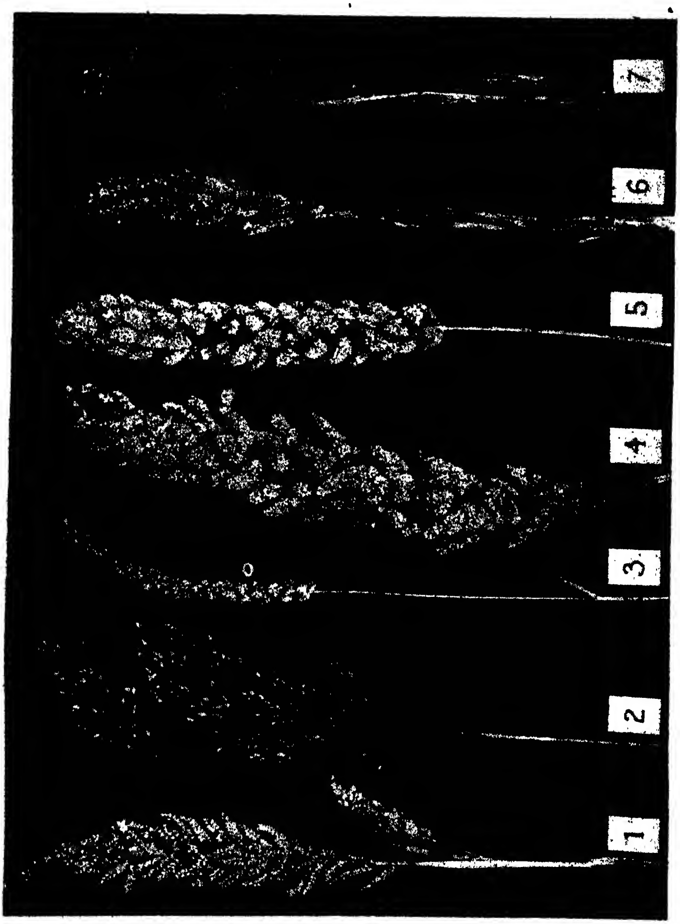
Time of Seeding.

Because of the short season of growth there is considerable latitude as to the time of sowing. As the young plants are injured by frosts, the seed should not be sown until all danger from this source is past and the ground is warm enough to insure a good germination. Under normal conditions, in Victoria the seed may be put in from late September to January.

Seeding.

The seed may be broadcasted, sown in close drills, or in rows. Where the summer rainfall is sufficient to supply the water requirements of the crop, either of the first two methods is preferable. In drier districts, or where the crop is grown for grain, the seed should be sown in rows a sufficient distance apart (2 ft. 6 ins.—3 ft.) to allow of cultivation and consequent conservation of the soil moisture.

The amount of seed used depends on local conditions, variety of millet, and method of seeding. If broadcasted or sown in close drills, from 9 to 12 lbs. per acre of Japanese or from 15 to 20 lbs. per acre of the larger seeded varieties should be sufficient. If seeded in rows, from 1 to 4 lbs. of seed per acre, according to the variety and the distance between the rows, will suffice.



Types of Millet.

1. Japanese.
2. French.
3. Common.
4. Yellow Manchurian.
5. White Manchurian
6. Golden Wonder.
7. Pearl.

Drilling in rows may be done by means of the ordinary drill, a sufficient number of the hoes being blocked up to give rows the requisite distance apart. The seed may also be sown with the Planet Junior drill, or a maize planter with special plates for the smaller seed. Owing to the smallness of the seed, it is important that it should not be sown too deep. If sown deeper than 1 inch a poor germination will probably result.

Fertilizers.

Millets are shallow rooted and therefore draw their nourishment largely from the surface soil. For this reason the supply of plant food should be concentrated in the upper layers of the soil and should be in a form readily available to the plant. Well rotted farmyard manure, if available in sufficient quantity, is particularly beneficial. It should be spread over the land before ploughing and turned in. Where farmyard manure is not available, liberal dressings of artificial fertilizers will be found profitable. In the drier districts a dressing of 1 cwt. of super. per acre will be sufficient. In the more humid areas a mixture of super. and Thomas' phosphate has proved good, while in certain districts nitrogenous manures may prove profitable.

Pasturing.

Millet serves admirably to supplement the pasturage during the summer and early autumn months. Provided it is not grazed too close, it will tiller better and sprout more freely after being pastured down. The paddock should be stocked when the millet is from 6 to 8 inches high, fed off to 3 or 4 inches, and the stock then removed till the second growth has reached a similar height. With careful treatment it can be kept growing throughout the summer and will provide a considerable amount of excellent feed. When cattle are pastured on millet the usual precautions should be taken to prevent injury by "bloating." They should not be turned on to the crop while hungry, and, at first, for not more than half an hour at a time.

Soiling.

For the purpose of providing green fodder for dairy cattle millet is especially adapted, the most suitable variety being Pearl or Egyptian millet. It yields a large amount of forage per acre, and, under favorable conditions, gives two or three cuts in a season. It is most succulent when young, and gives the best fodder if cut when from 3 to 4 feet high. Japanese millet is also suitable for soiling, and for this purpose may be cut as soon as the grass heads out, or even earlier.

Hay.

When required for hay, millet should be cut about the time most of the heads have appeared. The feeding value of the hay is probably greatest from this time until the seed reaches the milk stage. The hay may be cut with the ordinary binder, working about 3 inches from the ground. If cut closer, the plants may be injured, and consequently the second growth will be affected. The sheaves should be small and loosely tied to allow the leaves to cure readily. They should be stooked in rows, and when thoroughly cured stacked in the ordinary way.

Ensilage.

Millet has been employed for ensilage with satisfactory results. For this purpose the crop may be cut any time between heading out and the formation of the seed; preferably when most of the plants are in late bloom.

Seed.

Where the seed is required the crop should be allowed to mature before cutting. At the same time care must be taken that it is not allowed to stand until it is over ripe, or a considerable amount of seed will be lost by shedding. The crop may be cut with the grain binder, and the sheaves placed in long, narrow stooks. It is then allowed to stand in the paddock until the grain can easily be rubbed out in the hand. Threshing is done with the ordinary grain thresher, the screens being replaced by ones capable of handling the smaller seeds.

Feeding.

It has been found that when fed as sole roughage to horses, millet has a very injurious effect. Its continuous use is followed by increased action of the kidneys, general debility, a softening of the bones, and inability to stand. However, when fed sparingly, in conjunction with some other roughage and always with some concentrate, millet hay should prove satisfactory and produce no unfavorable effects.

CRYSTALLIZED, CANDIED, AND GLAZED FRUITS FOR HOME USE.

(By Miss A. Knight, Fruit Preserving Expert.)

Almost any variety of fruit may be preserved by these methods, but those generally favored are cherries, apricots, plums, pears, small oranges, kumquats, pineapple, and to a lesser extent quinces, melon, peaches, and gooseberries.

If a considerable quantity of fruit is to be treated it will be necessary to provide several fair-sized jars, wooden tubs, or other suitable receptacles in which to allow the different batches of fruit to steep in the various syrups. A saccharimeter or float gauge for testing the density of syrups would be found an advantage.

Fruits should be allowed to become slowly saturated with the sugar solution. To accomplish this, it is necessary to steep them for the desired length of time (according to variety) in syrups of varying densities, the required strength of which should be maintained throughout the process. Some varieties give a better result if they are first steeped in a medium syrup, the density of which should be gradually increased. Others must be cooked first, and afterwards put direct into a heavy syrup. It is essential that fermentation should be avoided during the steeping process.

Crystallizing.

The fruit, after being removed from the last immersion syrup as described, is partially dried off in a warm room, and then placed in the crystal. The crystal syrup is prepared by dissolving a good coarse-grained sugar in just sufficient water to melt it, about 6 lbs. sugar being allowed to each quart of water. The sugar should be dissolved before boiling heat is reached, and any scum removed. Test as soon as it boils; a degree of 220 deg. F. to 222 deg. F. is required; when this is registered, draw the pan aside, and allow the syrup to remain undisturbed until it has cooled off to about 98 deg. F. The fruit to be crystallized is then placed in crystal pans or suitable dishes selected for the purpose, covered with the crystal and allowed to remain in a moderately warm room for from 8 to 10 hours, or until sufficient crystallization has taken place. It is essential that the syrups be not agitated or disturbed during this process. When sufficiently coated, the syrup should be very slowly drained off; this may be done either by tilting the pans slightly, or by removing a plug from below. After draining slowly for some hours the fruit may be carefully removed, and placed on wire trays in a suitable place to dry. It should then have a good appearance and be covered with crystals.

To Candy the Fruit.

Make a syrup as above described, boiling it to a degree of 232 deg. F.; put a sieve-full of the prepared fruit into it, and with a wooden paddle stir slowly on the side of the pan, and, as soon as the syrup forms a fine grain, remove the fruit, putting it to drain and to set, and separating the pieces to prevent them sticking together.

Glazed Fruit.

To glaze the fruit, make a syrup, using 4 lbs. sugar, 1½ pints water, ½ teaspoon cream of tartar, and boil it to a degree of 300 deg. F. Dip the prepared fruit, and place it on a greased slab or large meat platter until set. Fruits treated in this way should have a clear, glossy surface.

Apricots.

Select first-grade fruit of a nice size and colour, but rather under than over ripe; partially open the apricots and remove the stone, this may be done either by making an incision in the stem end of the fruit and carefully pushing the stone through with a cooking needle, or the apricots may be cut open sufficient to allow the stone to be extracted. The fruit is then blanched in water or steam for a few minutes (care being taken not to soften the flesh too much), then dipped in cold water, and when drained are ready to be steeped in the various syrups. The first solution may be made by boiling together 4 lbs. sugar to each gallon of water for five minutes. The liquid should be cooled off to a temperature of about 170 deg. F. before the fruit is immersed. Very careful handling is required at this stage as the natural shape of the fruit should be retained as much as possible. During the saturation period all fruits should be well covered with syrup and not allowed to

float. After remaining two or three days, the syrup will have become weaker, as the fruit gradually absorbs the sugar. The syrup then requires to be strengthened—by adding more sugar and reboiling—on the second occasion to 218 deg. F. When cool, pour the liquid over the fruit again and allow it to remain as before for five or six days; then repeat the operation on two or three occasions, or even more if needed, to give the fruit a fine, clear, transparent, rich appearance. The last solution in which it is steeped may be boiled to a degree of 218 deg. to 220 deg. F., and if desired the fruit may be allowed to remain in this for an indefinite period, or may be finished off and packed away.

There are several ways of finishing off, and any may be adopted—crystallizing, candying, or glazing—while some prefer the simpler method of rolling the prepared fruits in sugar. The latter method makes a fairly good article, though, of course, not one so presentable as that which is crystallized.

Cherries.

Bright-coloured cherries should be selected for this purpose, and should be stoned as carefully as possible so as to avoid tearing unnecessarily the flesh of the fruit. They are blanched in boiling water for a few moments, drained, and immersed in the various syrups (finishing strength about 220 deg.) and allowed to remain until well permeated with the syrup. Cherries are sometimes artificially coloured by adding the desired colouring agent to the steeping syrups. When ready to be finished off they are drained, partially dried, and dealt with in same manner as described for apricots.

Pears.

Both the Bartlett pear and the winter variety may be crystallized. When using the latter the fruit should be peeled and the stems left. The pears should then be gently boiled in the various syrups in which they are steeped, until the red colour is gained. When the ripe pears are being treated, they are peeled, blanched, cold-dipped, and then covered with the syrup, which should be boiled to a degree of 218 deg. to 222 deg. F., and left until sufficiently preserved. The fruit should be drained every few days and the solution re-strengthened, so as to keep it to the standard. Afterwards pears may be treated in very much the same way as apricots. The steeping syrup for pears may be flavoured with ginger or such other flavour as is desired.

Green Gages.

These are usually done whole, and treated in a similar manner to apricots. The steeping syrups should be boiled from 215 deg. to 220 deg. F., and cooled off to about 170 deg. F. before pouring over the fruit. To finish, they may be crystallized, candied, or sugarded, and look well when treated by any of these processes.

Small Green Oranges.

Very small oranges should be selected. They should be first soaked in brine for a few days and then boiled in fresh water to which a little carbonate of soda has been added. Cook for about twenty minutes, and then cover them with a syrup heated to 218 deg. F., and leave them in this for a few days. Then increase the strength of the syrup by heating to about 225 deg. F., and allow the fruit to remain in this for a week or so, then dry off and crystallize or sugar as desired.

Figs.

Select the figs before they are fully ripe and simmer them for about half-an-hour in the syrup which has been heated to 217 deg. F. and flavoured with ginger. Allow the figs to steep for one or two days, and repeat the operation as with other fruits. The last syrup should be heated to 222 deg. F. Dry them off and crystallize or sugar, as desired.

Gooseberries.

Deep-red fruit may be topped and tailed, and afterwards treated in a similar manner to apricots, except that they should not be blanched. When dried off they may be glazed, as already described, in a syrup boiled to 300 deg. F.

Quinces.

They should be cut into sections and treated in the same way as winter pears.

Peaches.

Peaches should be peeled, pitted, and cut into desired sizes, and then treated in a similar manner to apricots.

Melon.

The firm part of the melon is cut into even-sized blocks or sections, steeped in water for thirty-six hours, and then boiled in that water until clear. The steeping syrups may be flavoured with ginger, which greatly improves the product; and if wished, they may be coloured. They should be brought to a heat of from 220 deg. to 230 deg. F., and poured over the melon whilst hot. After the melon has been steeped for eight or nine days it may be brought to boiling heat in sugar solution and again allowed to cool. When desired it may be dried off and either crystallized or candied; either method makes a good article for home use.

Pineapple.

Pineapple may be cut into blocks, triangular pieces, or in full slices with the core removed. After the necessary preparation the fruit may be blanched, or partially cooked in boiling water, then removed with a perforated skimmer and put to drain. A steeping syrup is heated to about 215 deg. F., and poured over the fruit. This operation may be repeated three or four times; the last syrup should be heated to 230 deg. F. The syrup does not need to be cooled off before it is poured over the pineapple. The fruit is then ready to be candied in a syrup boiled to 232 deg. F., and slightly grained as before described. At this stage it is also ready for use in a milk chocolate dip.

Apricot and Other Fruit Pulp.

Prepared fruit pulp may also be crystallized, rolled in sugar, or coated a good fondant cream, or with milk chocolate. First of all the pulp must be passed through a sieve. Meanwhile dissolve the sugar by boiling it as before directed to 254 deg. F. Allow about half the weight of sugar to that of pulp and only just sufficient water to dissolve the sugar. Mix the pulp with the boiling syrup and cook until the mixture is fairly thick. This may be spread in layers of a thickness of one-eighth of an inch on oiled platters and dried until it is stiff enough to be cut into shapes; it may then be sugared, or crystallized, or finished as may be desired.

It is sometimes an advantage to add a trace of tartaric acid to certain fruit pastes of this kind, so as to develop or make the fruit flavour more pronounced; this is added to the batch just before removing from the fire.

Peaches, quinces, figs, apples, guavas, plums, damsons, strawberries, black currants and logan and raspberries are all suitable for treatment in this way; the fruit should be selected ripe for the purpose.

Candied Lemon and Orange Peel.

Select clean-skinned fruit. Cut them in halves and remove the pulp, the juice from which may be used for other purposes.

Soak the peel in brine for not less than three or four days, though, if desired, it may be left for a much longer period. Then drain and wash, and boil gently in fresh, clean water until the peel is three-parts cooked. Then place it on a large sieve to drain. Meanwhile make a syrup of 4 lbs. sugar to 1 quart of water, which should be heated to 215 deg. F. Put the well-drained peel into this and simmer for five minutes. Then allow to cool in the syrup and steep from seven to ten days, or longer if desired, during which time it should assume a rich colour and an almost transparent appearance.

The peel should then be removed and partially dried, and when reasonably firm immersed in a finishing syrup (boiled to 232 deg. F.), and stirred until a slight grain forms, when it should be removed at once and placed to drain and set. The peel may, if desired, be allowed to remain in the first syrup until required. This saves the task of drying it off and finally coating it. This is sometimes a more economical method of storing, and the peel is just as serviceable for general use, though, of course, it is not so suitable for counter trade.

EGYPTIAN INCUBATION.*

By Capt. W. H. Cadman, B.Sc., A.I.C., Head of the Department of Agricultural Physics, Higher School of Agriculture, Giza, Egypt.

Origin and Inaccurate Descriptions of Egyptian Incubators.

The origin of Egyptian incubators is very remote, and probably dates from about 3000 B.C. Very little has been written about them, and inaccuracies are common in most of the descriptions hitherto published. The reasons for this are:—(1) The profession is an hereditary pursuit and is confined to particular families. It is handed down with plighted word from father to son. (2) The secrets are jealously guarded by the expert operators, who are trained at two towns only, Birma in Lower Egypt, and Bilbau in Upper Egypt, and (3) travellers visiting the incubators are regarded with suspicion, and even Native Government Inspectors are given false returns for fear of increased taxation.

The Buildings.

The Incubator is called in Arabic "Maamal el Ferakh," or "Maamal el Katakeet," meaning a factory of poultry or of chickens. Externally, the building is exactly like an ordinary native residential house, with the exception of the roof, which has a number of dome-shaped openings which, however, are not seen from the village streets. Sun-dried Nile-mud bricks are used in its construction, as for all old native houses in Egypt. The walls are very thick and the material used is a very bad conductor for heat. If the building stands alone away from other houses, the outer brick walls are invariably double, of about 1 foot in thickness. The space between is about one yard in thickness, and is filled with loose sand or fine earth mixed with chopped straw. I visited a small but typical incubator this year at Birma, near Tanta. The main entrance leads into a few rooms, some of which are used as living rooms for the owner and his expert operators, while others are used as storage rooms for eggs, fuel, &c. A small door leads from one of these rooms into a central passage of the Incubator proper. This is divided up by low ridges into a number of pens for the newly-hatched chicks. The roof is dome-shaped and has several small openings for light and ventilation. On either side of this central passage are the egg ovens, which vary in number from 6 to 26. Each oven is two-storied and each compartment has a small entrance from the passage, just big enough for a man to crawl through. These openings can be closed at will by means of sacks filled with flax-tow, or matting.

The upper and lower compartments are connected by an opening in the floor of the upper one, through which the operator can pass. Along both sides of this square upper floor and parallel with the central passage are shallow troughs, often lined nowadays with metal obtained from empty petrol tins. These troughs are about 8 inches wide and are used for the glowing fuel. One has to carefully avoid stepping on these tin-bottomed shallow troughs when crawling into the upper cell. The roof of the upper compartment is dome-shaped and has a central

* Reprinted from the *Utility Poultry Journal*, England.

hole for the escape of smoke, &c. The floor of the lower compartment is simply the earth compressed by use.

Method of Working.

Incubation only takes place for about four months of the year during the cold weather. Fleas and other insect pests peculiar to hot climates are left undisturbed during the remainder of the year. To destroy these pests and at the same time thoroughly disinfect the buildings before use, large fires are lighted inside the central corridor and in all the egg ovens. The fuel for this purpose consists of a mixture of dung and chopped bean straw. This preliminary heating is continued for a few days with the external openings mostly closed, while the eggs are being collected. All cracked or thin-shelled eggs are detected by tapping with the finger nails, and are rejected. By regulating the size of the roof openings, the ovens are next cooled down to the right temperature for introducing the eggs. *No thermometers are used.* Long experience enables the expert operator to know the required temperature by his sensation alone. All the fires are now discontinued, except those in the fuel troughs of the upper compartment. These are kept burning for the next ten days. Chopped bean straw alone is now used as fuel.

Each oven holds from 7,000 to 8,000 eggs at a time, but all the ovens are not filled the same day, so as to facilitate the working, and also to avoid having too many chicks hatched at the same time. An interval of from two to three days elapses between the filling of one oven and the next. Thus each oven is only used for four or five clutches during the season.

Before inserting the eggs, the floor of the lower compartment is covered with a rush mat sprinkled with bran. All the eggs are at first put on this in six heaps. The opening leading to the central passage is then closed, and this lower compartment is entered during the subsequent operations from the upper one through the hole in the floor, which can also be closed easily. Two of the six heaps of eggs are spread out directly beneath the fuel troughs, so that they are heated from above as with the sitting hen. The fuel only needs to be renewed twice daily, as the glowing bean straw burns quite slowly. The eggs are moved at intervals of about eight hours by simply pushing them round in rotation with the arms, those spread out being collected into a heap and the next heaps being spread out under the troughs in their turn. Each egg is thus frequently displaced, but no care is taken to turn each egg over as is recommended for many modern incubators. The temperature is noted from time to time by the operator or his assistants, who simply place an egg against the sensitive skin of the eyelid. The heat is controlled by regulating the roof openings, and the amount of glowing fuel. No water of any kind is introduced into the building throughout the whole period of incubation.

During the time the fires are burning there is a considerable amount of smoke and smell inside the egg ovens. On the seventh day each egg is examined by holding between the eye and a small olive oil lamp, or a beam of sunlight, and the clear unfertile eggs are removed and sold in the markets. After ten days all the fires are put out and the smoke quickly escapes. From now onwards the eggs are moved twice daily.

All ashes are removed from the troughs and mats are spread on the floor of the upper compartment. Half the eggs are transferred from the lower to the upper floor on the thirteenth day, and all the eggs are now spread out over the two floors.

The opening from the upper chamber to the central passage is now closed to maintain a more constant temperature for the eggs. As no fires are used from the eleventh day, it is evident that the heat necessary to maintain the required temperature for the remainder of the time is evolved from the development of the chicks within the eggs. Nearly all the chicks appear on the twenty-first day as with natural incubation. These are collected and thrown in armfuls into the pens of the central passage, and the following day are disposed of as day-old chicks. The custom of selling chicks by measure (as used for measuring corn or beans) is still practised at some incubators, but they are more generally counted.

Very few cripples or dead-in-shell are met with. Any such are thrown to the village dogs.

Statistics.

In 1911, at my suggestion, the Egyptian Government had the first census taken of incubating establishments throughout the country, when 512 were found to be working. The last census returns are for the season 1915-16, which shows 570 buildings, with a capacity of over 21,000,000 eggs at one time, of which 553 were working.

About 15 per cent. of the eggs are removed as unfertile or broken, and of the remaining eggs an average of from 80-85 per cent. hatch successfully for all the incubators of the country. The most expert of the operators often reach 90 per cent., and over. I have never, during seventeen years' experience of these incubators in all parts of the country, heard or come across a case of a complete failure. If this did happen, it would be a serious loss with so many eggs at stake.

Research.

To determine the conditions within the egg ovens during the period of incubation, I introduced self-recording instruments where possible. The results show a fluctuation of temperature within the lower compartment and beneath the fuel troughs of from 35 deg. to 40 deg. C. (95 deg.--104 deg. F.) during the first ten days, with a nearly constant temperature of 38 deg. C. (100.4 deg. F.) for the remainder of the period. The average temperature outside the building at the same time was 15 deg. C. (59 deg. F.) with an average daily range of temperature of about 12 deg. C. (21.6 deg. F.) between the hottest and coldest parts of a day and night.

The average temperature of a sitting of eggs placed under a turkey during the same period was 39 deg. C. (102.2 deg. F.)

The relative humidity during the first ten days varied from 38 to 50 per cent., after which it increased to 68 per cent., and then fell to 45 per cent. on the thirteenth day, and again rose to 70 per cent. on the fifteenth day. It then gradually fell to 45 per cent. on the twenty-first day; the mean relative humidity for the period of incubation being about 50 per cent. against 71 per cent. outside the building.

The mean daily relative humidity at Cairo is about 75 per cent. during the winter, and 60 per cent. during the summer. The humidity at Marg, where the incubator examined was situated, is reduced by proximity to the desert.

The products of combustion from the burning fuel and from the olive oil lamps used for illumination and egg testing inside the ovens, together with the products of respiration from the attendants and from the developing chicks, all tend to make the composition of the air within the incubators very different from that of the outside air. By means of a Dr. Haldane's portable carbon-dioxide testing apparatus (such as is used in coal mines) the average amount of carbon-acid gas per 10,000 volumes of air inside the egg ovens was measured throughout the period of incubation.

For the first ten days the average was about 15 parts by volume in 10,000, with a range of from 10 to 25. The amount then increased until the thirteenth day, when it reached a maximum of 48. It now fell gradually to 15 on the last day of incubation. The mean for the whole period of incubation being about 25 parts against about 3 parts in 10,000 outside the building, and a mean of about 12 parts in 10,000 under a broody hen sitting on eggs. A comparison of this curve with the relative humidity curve shows clearly a marked change taking place (1) from the tenth day, and (2) from the thirteenth day, which have long been recognised by the illiterate operators as critical periods in the development of the chicks.

Conclusion.

It is certain, therefore, that in natural incubation as well as in the artificial incubators in Egypt and China, the air surrounding the eggs contains a much larger proportion of carbonic acid gas than atmospheric air. How is it that this proportion of carbonic-acid gas is not as injurious to the development of the chick as it would be to human beings? The Egyptian operators and their assistants are always pale and thin from breathing this foul air and do not appear to live as long as their neighbours who are otherwise employed. Is the natural explanation that suggests itself satisfactory and sufficient, viz., that the embryo in the egg requires a certain amount of this gas for its optimum development? Physiologists have already proved that carbonic-acid gas is indispensable to the evolution of fœtal life in certain animals and man, then why not in chicks also? The introduction of carbon-dioxide by artificial means into modern incubators has so far given excellent results when compared with control experiments in which this was not done. Not only was the percentage hatch greater, but the chicks were stronger and the dead-in-shell were very much reduced.

Further experiments must be made, however, to prove or disprove this deduction.

Additional Note.

It is rare to find a native hen broody in Egypt. The instinct to sit appears to have been lost through the extensive use of Egyptian incubators.

EXPERIMENTS IN THE COOL STORAGE OF CITRUS FRUITS.

Report by Exports Superintendent (Mr. R. Crowe).

The first experiment in storing citrus was made in 1904. On the 30th November of that year 250 cases of oranges and lemons were placed in the Government Cool Store, Flinders-street. They remained there till the 21st December, when they were taken out in good condition. The short period they were left in storage was due to the favorable market just before Christmas.

In 1905 over 1,000 cases were stored in the Government Cool Store at Doncaster, where they were left for periods varying from four to six weeks; the markets then being favorable they were disposed of. At the time the fruit was delivered from the Store its condition was such that it could have been kept in cool storage for a much longer period.

In 1907 a total shipment of 1,600 bushel cases of "Washington Navels," "Late Valencia," and "St. Michael" varieties was sent from Victoria to London. The fruit was landed in good order, and realized from 12s. 6d. to 16s. per bushel.

During 1910, 2,000 cases of citrus were put in the Government Cool Store at Doncaster, and after being stored there for periods varying from two to three months, were delivered in good commercial condition.

On 19th July, 1915, 18 varieties of oranges were placed in the Government Cool Stores, Victoria Dock, and upon inspection on 30th September (76 days afterwards) were found to be in good condition. The varieties giving the best results were:—

"St. Michael,"
"Common,"
"Late Mildura Seedlings,"
"Australian Navel,"
"Queen Orange,"
"Late Valencia."

The next best were—

"Maltese Blood,"
"Azorian,"
"Wolf's Skin Seedlings,"
*"Emperor Mandarin,"
"Seville."

The third best keepers were—

"Ruby Blood,"
"Canton."

After which came—

"Egg-shaped,"
"Parramatta,"
"Poor Man's Orange."

Then "Siletto"; and, finally, "Mediterranean Sweet."

* "Emperor Mandarin" had reached the limit for keeping, and, although still good, they would not bear the handling and marketing.

Only one case of each was included in the above experiment.

Five varieties of lemons were also stored for the same period as the oranges above-mentioned. The best keepers proving to be "Eureka" and "Wild"; next to which came "Chinese"; then "Lisbon," and finally, "Densey".

Recent experiments were made with 361 cases of oranges obtained from various growers in the Tresco and Nyah irrigation districts. They were placed in cold storage on 27th July last, and were examined on the 4th October—after a storage period of nine weeks and six days.

The temperature of the fruit when picked averaged 65 degrees Fahr., and on arrival at the Government Cool Stores averaged 68.5 degrees. The temperature of the chamber during the experiment averaged 36 degrees by the dry thermometer and 35 degrees by the wet bulb thermometer—equal to 90 degrees humidity.

The results showed that there was less loss in the wrapped fruit than the unwrapped, either in lined or unlined cases, as of 112 cases wrapped, 6 were lost by disease and 10 through loose packing; a total of 16, equalling 14.29 per cent. Of the naked fruit (116 cases) 7 were lost owing to disease and 14½ as the result of loose packing—a total of 21½ cases, equalling 18.53 per cent. And, of the fruit in the lined (133 cases) 14 were lost through disease, and 16½ by loose packing; a total of 30½ cases, equalling 22.92 per cent.

The methods of packing (diagonal or square) and kinds of cases used (hardwood or softwood) appear to have had little or no effect on the results, and it would appear that lining the cases is not so effectual in preventing loss as the wrapping of the individual fruit.

When the fruit was re-packed for sale, there was a total loss of 68 cases—equal to 18.83 per cent. The loss was not actually as heavy as the figures indicate. A portion may be accounted for by the cases reaching the stores loosely packed, and, when ultimately re-packed, the fruit naturally went into smaller space.

The losses could have been materially reduced by more careful picking, handling and packing, and the wrapping of the fruit individually.

The value of the 361 cases when originally put into the Store was estimated at 6s. per case, or £108 6s. The 293 re-packed cases averaged in the market 13s. 10½d., or £203 5s. 4d.

Storage at 1¼d. per case for ten weeks would have amounted to £18 1s.; therefore, the net gain was £76 18s. 4d., after allowing for losses and cool store charges.

Three thousand one hundred and seventy-one cases of oranges were placed in the Government Cool Stores, Victoria Dock, during the period from 10th to 31st August, 1921, and were marketed up to 25th October in good condition.

OATS AS A FOOD FOR PIGS.

Although, as a rule, oats are preferably fed to horses, cattle, or sheep, I see no good reason why they should not be fed with advantage to pigs when other avenues are closed, says the Director of Agriculture (Professor Arthur J. Perkins). As to whether this can be done profitably or not will depend, of course, on the current market value of oats, and on the price that can be realized for pigs fed on them. Feeding pigs on oats alone is hardly to be recommended, except, perhaps, when fattening-off old sows. For younger pigs, particularly for growing ones, some more highly nitrogenous foodstuffs should be associated with oats. If grazing, particularly leguminous grazing (lucerne, clovers, &c.), is available, no addition will be needed. I suggest the following oat ration for pigs of various ages and sizes:—

For Young Growing Pigs, 40 lbs. to 80 lbs. in Weight.—If oats alone are fed, daily requirements would be represented by 2½ lbs. to 5 lbs. according to sizes. The oats should either be crushed or soaked over night in no more hot water than they would absorb. They should be given, preferably, in three meals. The above figures presuppose the oats to be first quality; if inferior, quantities may have to be increased.

The following, however, represent far better rations for young pigs and are recommended:—

	40-lb. Pig.	80-lb. Pig.
Ration 1—		
Crushed oats	2 lbs.	4 lbs.
Skim milk	2½ lbs.	5 lbs.
Ration 2—		
Crushed oats	2 lbs.	4 lbs.
Abattoir's pig meal	¼ lb.	½ lb.

For Fattening Pigs, 120 lbs. to 160 lbs.—Again, if oats alone were fed, daily requirements according to size would be 6 lbs. to 8 lbs. with sufficiency of green feed if available. But there is nothing to be gained in stinting fattening animals; the main object in view is to fatten them off as rapidly as possible. They must absorb a definite amount of food to reach market condition, and it is more economical that this food should be consumed in a short, rather than in a long period of time. Waste, however, should naturally be avoided and animals fed according to their appetites and ability to clean up their feed-boxes.

In preference to oats alone, and in the absence of other available material, the following rations may be recommended:—

	120-pounder.	160-pounder.
Ration 1—		
Oats	5 lbs. ..	7 lbs.
Skim milk	5½ lbs.	8 lbs.
Ration 2—		
Oats	5 lbs.	7 lbs.
Abattoir's pig meal	½ lb.	¾ lb.

Journal of Agriculture of South Australia, December, 1921.

WHEAT-GROWING.

Assuming the adoption of up-to-date methods of cultivation, it is estimated that Australia's potential wheat-growing country covers an area of between 200,000,000 and 300,000,000 acres. It is unnecessary, perhaps, to go beyond those figures for the present. It is important in passing, however, to point out that experts are loth to delimit the possible acreage. Within the last fifteen years agricultural science has opened the way to such an enormous extension of the cultivated area that it is unwise to conjecture as to the future developments. Australia is now developing varieties of wheat for light rainfall localities, and has evolved cultural processes for the conservation of moisture which suggests the probability of the frontier of cultivation being pushed still farther inland. Accepting even 200,000,000 acres as the area of the proven safe wheat-growing territory, there is room to-day for twenty-fold expansion of the cultivation country. In 1915 Australia sowed 12,000,000 acres under wheat. This is her maximum attainment so far as area is concerned. The year 1915 also marked the highest average yield per acre. In that year 14 bushels per acre were obtained, although the average annual production is just short of 10 bushels per acre.

Australia's reputation as a wheat-growing country has suffered, strangely enough, by the very richness of the soil and the kindliness of the climate. Growers have adopted speculative methods on the chance of big harvests. They have aimed at great acreages instead of at good cultivation. The disparity in the returns obtained by the indifferent farmer and the good farmer is amazing. Many growers, although unfortunately far too few, average year in and year out at least 20 bushels per acre. They enjoy no natural advantage over their neighbours, who, perhaps, average only 8 bushels per acre; but they cultivate their land instead of merely scratching its surface.

In no country in the world are the prospects of the wheat-grower brighter than in Australia. The average yield may be at present comparatively low; but the cost of production per bushel is relatively lower. It is in the low cost of production that the Australian has the advantage. Land values, although they have risen considerably during recent years, still remain at a fairly low level. Wheat country is obtainable at from £2 to £10 per acre. Big teams and big implements reduce the cost of cultivation to a minimum. One man can put in and take off about 200 acres of crop unaided. The small farmer, therefore, employs little or no labour during the year.

The majority of the Australian farmers began as labourers, and have had no scientific training. They earned good wages, saved hard, and eventually obtained land on easy terms. The way is still open to the present generation to do the same.—[From an article entitled, "The Empty Continent," written by Lord Northcliffe.]

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

YOUNG TREES.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

FUMIGATION.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this pest. For spraying, a weak red oil emulsion, lime and sulphur spray, or resin wash will be found useful. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. A wooden, enamel, or earthenware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium is then quickly dropped into the vessel, the tent closed down at once, and the bottom of the tent all round covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time or on a cloudy day, if the foliage of the trees be thoroughly dry.

The Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

The Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they develop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, and delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

LIVE STOCK.

HORSES.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

CATTLE.—Cows in milk should have plenty of succulent fodder and water easy of access. When cows in milk have to be fed on chaff it should be soaked with about half its bulk in water from 12 to 24 hours and the necessary concentrates mixed in at time of feeding. This soaking will soften the grain in the chaff, preventing its loss in the droppings, and is the nearest substitute for the succulence so necessary. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available. It will pay well to feed crushed oats to good cows.

PIGS.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. Pigs should be highly profitable now. Pollard should be used for very young pigs, and bran for suckling sows, and to help to prevent constipation.

SHEEP.—All ewes should be kept strong for lambing. Crutch round tails and lessen accumulation of discharge, and consequent attraction to the fly pest at lambing time. Clear wool from round udders and teats and thereby save many a lamb in bad weather; especially is this necessary in the case of young ewes of the Merino and Lincoln crosses. Clear wool from eyes also. In crutching ewes when close to lambing lay them over carefully, grasp by the thigh low down, not by the flank as is generally done. Pure British breeds of ewes and very coarse cross-breds may still be only coming in season; rams should be left mated to make sure. Clean excessive wool and stains from ewes, and burr and stains from rams to ensure service. Reserve good paddocks for ewes with early-born lambs. Where possible, castrate ram lambs immediately. Fair prices will be available this winter, particularly for lamb.

POULTRY.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. This will act as a safeguard against chicken pox; burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Use tonic in mash, which should be kept in cool shady spot.

BEE-KEEPING.

Since the end of November the season has been quite abnormal from the bee-keepers' point of view. Owing to frequent cold changes and southerly winds but little surplus honey has been stored from Yellow and Red Box, even in favoured localities, so that the total yield will be far short of what was expected.

Grey box, which is considered to be our most dependable honey tree, is showing very little bud, and the flowering will apparently be late in some districts—too late to be of any use to bees, unless we have an exceptionally warm autumn.

During February bees commence to arrange their stores of honey and pollen in preparation for the coming winter, and it is therefore unwise to interfere with the combs in the brood chamber, to insert empty combs between the brood, or to change the position of the combs.

Where there is a surplus of honey in the upper story, it is best not to take the whole of it in one operation, but to take half, and when the emptied combs are filling up again take what was left. At this time of year bees will work better and keep on breeding longer with a full, or partly filled, super than with empty combs above the cluster of bees.

When there is a shortage of honey in February or March, it is best to give only enough sugar syrup to carry the bees through till April, but to give whatever amount is necessary in the shortest possible time. Feeding extending over many days will stimulate brood-rearing, and a few weeks later the bees will be short of food again, compelling further feeding.

In the case of colonies below the normal strength in the number of bees, continuous light feeding will do no harm; it will, on the contrary, be beneficial, as it increases the number of young bees, but the feeding for winter stores should be deferred till the middle of April, when but little of it will be used for brood rearing.

CULTIVATION.

FARM.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

ORCHARD.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

VEGETABLE GARDEN.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

FLOWER GARDEN.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

VINEYARD.—Select scions, if not done last month. In cooler districts, where ripening is difficult, it may be assisted by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

Cellars.—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to acidity; correct same if necessary with tartaric acid or late grapes. Acidimeter supplied by Department; price 6s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.

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NAURU AND OCEAN ISLAND.

Progress under Government Ownership.

By Harold B. Pope (Commissioner for Australia).

In the August number of this *Journal* the writer gave a short history of Nauru and Ocean Island, and described briefly the nature and extent of their phosphate deposits and workings. An account of the progress made during the first eighteen months of the Commissioners' control (to 31st December, 1921) may be of interest to readers of the *Journal*.

It will be remembered that, when referring to the total annual output from the two islands, it was stated that the Pacific Phosphate Company's best year was 1913, when practically 350,000 tons were shipped. Actually the exact quantity was 338,961 tons.

The Commissioners assumed control on the 1st July, 1920, and during their first year, which ended on the 30th June, 1921, a total quantity of 364,424 tons was despatched from the two islands. It will be seen that in the first year the total shipments improved by 25,463 tons. Information now available shows that the total quantity shipped for the twelve months ended 31st December, 1921, amounted to the record figure of 394,051 tons. This is 55,090 tons more than the Pacific Phosphate Company's best year. At a glance the comparisons are therefore:—

Pacific Phosphate Co.'s record year (ended 31st December, 1913)—338,961 tons.

British Phosphate Commission's first year (1st July, 1920, to 30th June, 1921)—364,424 tons.

British Phosphate Commission's twelve months (ended 31st December, 1921)—394,051 tons.

The shipments for the last year under the Pacific Phosphate Company—1st July, 1919, to 30th June, 1920—amounted to 225,524 tons.

1794.

It was expected that the output for 1921 would reach 400,000 tons, but owing to bad weather prevailing during part of December (November-February usually constitutes the "westerly" or bad weather season) our total shipments (394,051 tons) for the year were just a little short of that quantity. The increased shipments have been made with practically the same plants, and without any increase of staff, white or coloured, on either island.

The results for the first eighteen months under the new control may be summarized as follows:—

The total quantity shipped during the eighteen months ended 31st December, 1921, was 554,656 tons, which was distributed in the following manner:—

	Tons.
To Australia	357,496
„ United Kingdom ..	32,300
„ New Zealand	29,750
„ other countries ..	135,110

As one ton of phosphate makes nearly two tons of superphosphate, after being treated and mixed with sulphuric acid, this means that something like 715,000 tons of superphosphate, made from Nauru and Ocean Island phosphate, were manufactured and used in Australia during the comparatively brief period of eighteen months. Press reports indicate that this season's wheat harvest in Australia has proved a particularly good one. It is the Commonwealth's share in Nauru and Ocean Island, resulting in increasingly large shipments of high-grade phosphate pouring into this country from those islands which, in a large measure, has made this possible. Now that we have guaranteed supplies for a great many years to come of some of the highest grade phosphate in the world, there appears to be no reason why the area under wheat should not be larger and still larger, and future harvests still more bountiful.

The indirect benefits which Australia reaps from its share in Nauru and Ocean Island are also very considerable. In addition to the large quantities of phosphate being brought to Australia by Australian-owned vessels, the discharging alone of these ships gives employment to a large number of men. One vessel—Messrs. Howard Smith's *Century*—will serve as an example. This modern cargo carrier, which is under time charter to the Commission, usually completes the round trip in six weeks. She lifts 6,550 tons and, during her discharge, which usually takes from four to five days, working day and night, employment for no less than 120 men (two gangs each 60 strong) is provided. I understand that the number of men employed by the various Australian Superphosphate Works in manufacturing, grading, and bagging, is something like 2,000. Coal shipped from Australia, and used on Nauru and Ocean Island, for the eighteen months ended 31st December, 1921, amounted to 10,000 tons, which does not, of course, include the large quantity of Newcastle coal consumed on the steamers engaged in the phosphate trade. Stores purchased by the Commission during the same period reached a value of over £300,000, of which the portion bought in Australia amounted to over £230,000, including £90,000 spent on provisions.

With the exception of the bad weather encountered in December last, the Commissioners were fortunate in that fine weather prevailed practically throughout the remainder of the year. When it is remembered that all vessels are loaded while moored to buoys about two ships' lengths from the shore, and in an unprotected open roadstead, it will be readily understood how, on Nauru and Ocean Island, we are at the mercy of the weather. Immediately the breeze shifts to the north-west, west, or south-west, the shipment of phosphate becomes impossible, and vessels at the loading berths must slip their moorings and put to sea.

For some years after operations were first commenced at the islands, wooden jetties, with a deck level of about 25 feet above the reef, were used. These only reached to and not beyond the edge of the fringing reef. During the "non-surf" days, in fine and settled weather, lighters could approach with safety the shoots at the end of those jetties and load with comparative ease, but as soon as the surf became troublesome (as it so frequently does, even in the very finest weather) the edge of the reef became a boiling cauldron. The result was that the lighters could not be held steady even for the few moments necessary to fill them with phosphate, and loading had in consequence to cease. When the present steel cantilever jetties (which give an overhang of 70, and even 80, feet) were installed, surf difficulties were largely obviated, for it follows that a lighter loading 70 or 80 feet out in the deeper and smoother water is much less hampered than one endeavouring to load in the surf at the reef edge. But, even with the present jetties, loading has to be discontinued when the surf becomes particularly heavy.

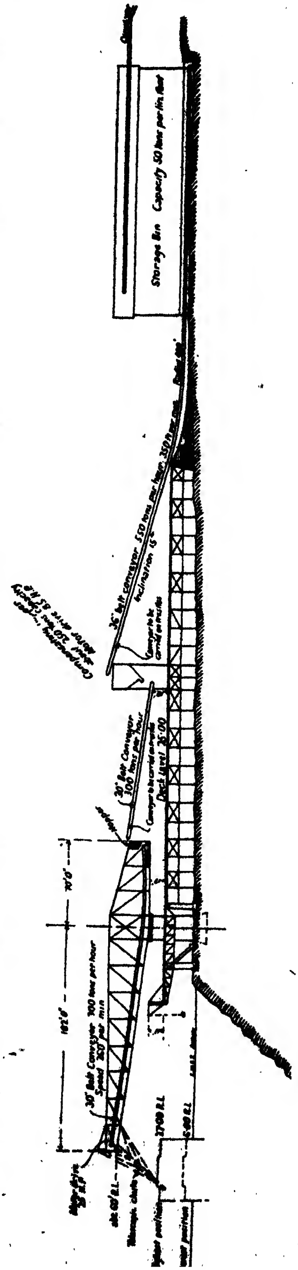
In order to make themselves as independent as possible of the weather, the Commissioners, whose combined island experience extends over nearly 60 years, intend to install at Nauru a cantilever or gantry capable of loading a 7,000 or 8,000 ton vessel in twenty-four hours. When the Nauru cantilever or gantry has proved itself a success, a similar plant will be installed at Ocean Island. Though the initial cost of the proposed erection at Nauru will be considerable, the savings effected by its successful operation will more than compensate for the outlay involved. It may be interesting to mention the methods by which these economies will be accomplished. A vessel capable of lifting, say, 8,000 tons would be loaded and despatched in twenty-four hours instead of taking a week or more to complete, as at present. Cheaper freights will thus be procurable. The labour of the "boys" employed in the lighters and launches will be saved. The boat repairing, basket repairing, and basket making gangs will be considerably reduced, if not entirely eliminated, and it is probable that the ship and jetty gangs will also be capable of reduction. The labour of all these men will then become available for raising phosphate, and the yearly output of Nauru alone (which was 241,440 tons in 1921) should considerably increase.

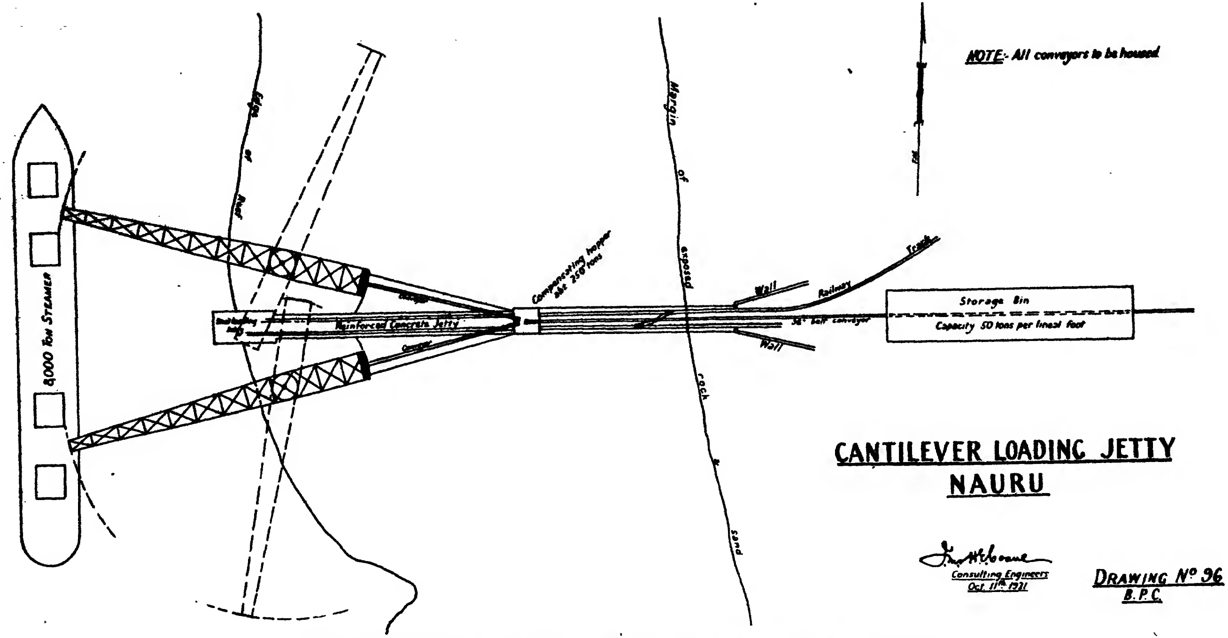
A great deal of consideration has had to be given to the advisability, or otherwise, of installing this plant. If a large steamer should collide with it, before the vessel was properly moored, it would probably result in the partial or complete destruction of the cantilever. On the other hand, should a vessel strike the reef when being warped into position, it might easily mean her total loss. The sea, surf, and wind pressure had also to be carefully taken into account. The new loading scheme

will involve the necessity of putting down specially heavy moorings to hold vessels securely in position under the cantilever arms, but this can be done. Under the present system of loading, the weather requires to be most closely watched; under the proposed new system, this will still be the case, but once a vessel comes under the gantry and commences to take in phosphate, loading operations will not cease until she has completely finished. The loaded vessel will then be either hauled to outer moorings or put to sea.

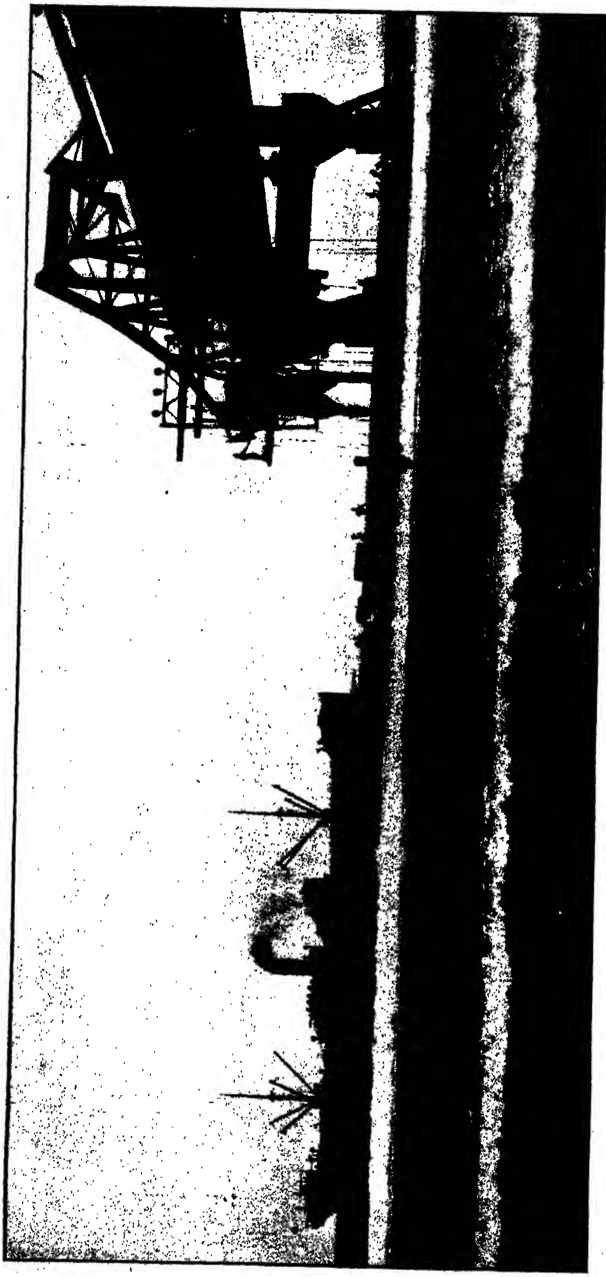
The cantilever will be Y shaped. Each arm will overhang the edge of the reef to the extent of 150 feet, the outer or seaward ends being about 60 feet above the level of the sea at high tide. Along the stem of the Y a broad rubber belt, driven by powerful electric motors, will deliver phosphate to a compensating hopper near the base of the fork, at the rate of about 500 tons per hour. From beneath the compensating hopper, which will hold about 250 tons, two smaller rubber belts, each capable of carrying 250 tons an hour, will diverge and run out on either arm. At the end of these arms will be attached a flexible shoot into which the phosphate will be delivered. One of the arms will load the Nos. 1 and 2 hatches of a steamer, and the other the Nos. 3 and 4, and, when not in use, both will be swung in-shore.

The Commission's resident engineers at the islands have drawn up plans embodying their ideas as to the type of cantilever or gantry which will be the most suitable for local conditions. The plans have been submitted to the Commission's consulting engineers, Messrs. J. M. and H. E. Coane, of Queen-street, Melbourne. Messrs. Coane, whose principals have visited the islands on several occasions in their official capacity, are thoroughly acquainted with the conditions there, also with our requirements. They have drawn up revised and improved plans and specifications. Copies of these have now been forwarded to several of the world's leading bridge builders with an invitation to tender for the installation. A reply from a leading Australian firm of constructional





Preliminary Sketch of proposed new Cantilever Loading Scheme at Nauru.



S.S. "Baron Inchcape" loading a record cargo of 9,112 tons at Nauru. November, 1921.

engineers, signifying its intention of tendering for the contract, has already been received. It seems that a cantilever cannot be made, conveyed to the island, erected there and be in complete working order under two or three years, but when it is installed the Commissioners will feel that they have reduced to the absolute minimum their dependence on the weather. Should bad weather come when we have the gantry—and, of course, that is inevitable—every effort will be directed towards accumulating large stocks and filling the extra storage accommodation which is being provided for under the new scheme. Then when the fine weather returns, the waiting vessels will be loaded and despatched at the rate of one a day.

In November last the largest steamer ever dealt with at either of the two islands was loaded at Nauru. This was the *Baron Inchcape,* which loaded 9,112 tons in seven working days. Though greater care will have to be exercised, I am inclined to think that, provided the weather is fine, even these particularly large vessels will load with greater safety under our new cantilever or gantry than they do at present, whilst moored about two ships' lengths from the shore. The new moorings to be laid in connexion with the cantilever and new system of loading, will be considerably closer in-shore, and a vessel moored to them will be much less exposed to the off-shore or north-east, east, and south-east breezes, also the current. During the fine "easterly" weather, when loading is carried out, a strong equatorial current, set up by the north-east and south-east trade winds, usually runs past the island in a westerly direction. This current first strikes the island on the eastern side, and then divides into two parts, which sweep round the northern and southern shores until they meet, at some varying point, on the westward side where they unite again and continue on in a main westerly direction. Where the moorings are at present placed, a vessel lying there is frequently subjected, on account of the varying point at which the divided waters meet again, to a strong northerly or southerly "set." It is a common sight, therefore, to see a vessel at the buoy "tailing" north in the morning, and straining heavily at the moorings in a southerly direction in the afternoon. These alternate strainings, by a large and deeply laden steamer, are a very severe test on the moorings. Closer in, a steamer will be less under the influence of the off-shore breezes, also the northerly and southerly sweep of the current, and, consequently, in all probability, lie more snugly.

In June last the Commissioners received their first New Guinea labourers from the Australian Mandated Territory. These "boys" and the second contingent recruited towards the end of the year, speedily settled down and are doing well. Nauru, with its large steamers coming and going, its steam and electric locomotives, electric light, power-house, picture show, open air theatres (both European and Chinese), tennis, cricket, native brass band, &c., is proving a source of great interest to them, and they are happy and contented. I know of no place in the Pacific where coloured labourers are better housed, paid, fed, and treated, than they are on Nauru and Ocean Island.

CROP AND FALLOW COMPETITIONS, WARRACKNABEAL, 1921.

Report of the Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer, Department of Agriculture.

Herewith I have much pleasure in forwarding my awards and report for 1921 of the Annual Crop and Fallow Competition conducted by your society.

That the competition is gaining in interest at Warracknabeal is evidenced by the increased number of entries received this year—39, as against 26 last year. But it is doing more than that; it is leading to the adoption of improved farming practices in the district. The type of improvement that has taken place may be illustrated in a concrete way by a comparison between the rates of seeding and manuring that the competitors have given their crops during the past two years. In the initial competition last year it was noticed that the amount of seed

Farmers Judging Competition Field Day.—Govt. Experimental Plots, Warracknabeal.

and manure applied per acre over most of the district was considerably lower than that indicated as most profitable by Government experiments on similar soils and found satisfactory on certain private farms. Farmers at Warracknabeal were therefore urged to increase their rate of seeding to about 75 lbs. per acre on any of the stronger types of land, and the quantity of manure up to at least 112 lbs. of super. per acre on all the black land and fringe country. A statistical examination of the quantity of seed per acre used by the competitors then showed a range from 60 to 95 lbs. per acre, and that it averaged 69 lbs. per acre.

This year the seed used still showed a correspondingly wide range, but it averaged 76 lbs. per acre. That is to say, there had been an average increase in the rate of seeding of 10 lbs. per acre.

Similarly the amount of superphosphate applied last year varied from 56 lbs. up to 118 lbs. per acre. This year no competitor used less than 84 lbs. per acre. One applied 130 lbs. per acre, and the whole

averaged 100 lbs. per acre for the 21 crops inspected. The average increase was, therefore, 11 lbs. per acre.

An improvement has also been noticed in the direction of the type of fallowing adopted, and the method of working the fallows. Summer-fallowed land carefully worked has undoubtedly produced the heaviest crops in the Wimmera during the past six or seven years. That fact has been brought out by the farm competitions. The winning crop at Warracknabeal last year was a summer-fallowed one; so, too, is the winning crop this year. Whereas only a few of the fallows entered for competition last year were summer-fallowed, more than half those entered this year have been prepared in that way.

Warracknabeal Soils.

The Warracknabeal district is one of varying soil types. It is situated close to the Mallee fringe. There is land typical of the Mallee, and other soil representative of the Wimmera. The Mallee type is a

A Good Wheat Crop. (Mr. P. Leeke, Warracknabeal.)

good, sandy loam overlying a retentive clay. The Wimmera type comprises black and grey-black clay loams and red clays and loams. There are also types peculiar to the fringe country. On this latter soil the timber indigenous to the Mallee and the Wimmera intermingles. The soils on the fringe are even more free-working that those of the Wimmera. As a rule, the black Wimmera soils can be relied upon to produce the heaviest yields, with the fringe country next. The Mallee soils on the whole produce lighter crops. The red clays are refractory to work, and in wet years often give rather poor yields.

So far, no special recognition has been made of soil variation in framing the rules for the competitions at Warracknabeal. This means that competitors who farm the lighter soils labour under some disadvantage. In future it might be advisable to institute a separate class for Mallee soils.

The season was a good one, and the crops excellent. They were surprisingly free from disease. The yields in many cases have not been

quite so heavy as expected. The hot winds just after flowering time no doubt checked the free development of the grain. The red rust which made its appearance on the flag probably also played its part, and cutworms did slight damage.

Results.

SECTION I.—FOR BEST 100 ACRES WHEAT.

(Open Competition.)

The crop awarded first prize is that of Mr. T. Pearce. This crop was grown on a fine black flat, some 236 acres in extent, at Kellalac. The variety, Federation, was very pure. The crop was quite free from weeds and rubbish underfoot. There was a little take-all and black rust present. The yield should have been heavy. Seventy-five pounds of seed per acre, obtained direct from Longerenong College, was sown, together with 112 lbs. of superphosphate. The land was summer-fallowed as follows:—In March it was disced; in winter the scarifier

Attractive Farm Residence. (Mr. A. Arnold, Warracknabeal.)

and harrows were used. These two operations were repeated in September and again in October. The paddock was then allowed to stand until the following autumn, when the fallow was re-scarified, and the seed sown with a combined drill in June.

A second entry submitted by Mr. Pearce did not appear quite so heavy in yield, but it was also an excellent crop. It was also grown on summer-fallowed land, and sown with the combined drill at the end of June and early in July. Seventy-five lbs. of seed and 112 lbs. superphosphate were used.

The second prize is awarded to Messrs. M. E. Schultz and Sons' No. 1 entry. This crop of Federation is interesting in that it is the product of seed which has been hand-selected for several years by Messrs. Schultz Bros. The yield was heavy and the crop clean. The heads of the wheat, though all of Federation, did not present so level an appearance as is desirable. That was due to the inclusion of tall variants in the wheat selected. The points deducted under the head of type were made for this reason.

The crop was grown on winter fallow. The land was ploughed in June, then harrowed in mid-August. In October it was scarified, harrowed at the end of November, and re-harrowed in March after summer rains. Finally, the paddock was scarified up and sown at the end of June. Sixty-five lbs. of wheat were used, with 84 lbs. of superphosphate per acre.

Several of the remaining crops appeared heavier than this one, but they did not score so consistently in all departments. Messrs. Lamonte Bros.' No. 1 entry was Federation wheat grown on summer fallow. Seventy-five lbs. of wheat were sown per acre, with 95 lbs. of manure. The crop was even and dense.

The 145 acres of Federation of Dookie strain shown by Mr. P. F. Lehmann, of Katyil, is worthy of notice. The bulk of the land, which is a grey-black limey flat on the fringe country, was summer fallowed. In April the disc cultivator was used, then the scarifier in July. The scarifying was repeated in September and again in November. The

A Heavy Crop of Federation. (Mr. P. F. Lehmann, Katyil.)

fallow was one of those entered for the competition last year, but in November it did not present a particularly attractive appearance. Subsequently it received the following treatment:—Harrowed in February, harrowed in March, spring-toothed in April, and finally it was sown with the combined drill and then harrowed with heavy harrows. Ninety to 96 lbs. of seed were used, and from 120 to 140 lbs. of superphosphate. The February harrowing was done when the land was dry, because the fallowing was cracking.

Mr. H. McLean's crop was a heavy one for Mallee land. Sixty acres were Penny and 40 acres Federation. Mr. McLean finds that Penny yields very successfully with him. That experience is borne out by the yields on the subsidy-experimental field at Mr. Geo. Coutts'. The crop was sown with the combined drill at the end of June. Penny does not stand quite so well as Federation, but it cannot be said to be weak in the straw.

This crop, together with that of the winner, scored highest from the point of view of purity.

Heavy crops were also shown by Mr. Geo. Clyne and Mr. F. R. Kinghorn. That of Mr. E. Parsons was good for Mallee land.

Details.

SECTION I.—FOR BEST 100 ACRES WHEAT.

(Open Competition.)

Name.	Soil Type.	Yield.	Purity.	Disease.	Weeds.	Evenness.	Total.
Maximum Points ..	..	35	20	15	15	15	100
T. Pearce, No. 1 ..	Black clay loam	35	19	13	14	14	95
M. E. Schultz and Sons	Loam, Mallee fringe	30	18	14	13	14	89
Lamonte Bros., No. 1	Grey-black clay loam	33	17	11	13	14	88
H. McLean ..	Sandy loam, Mallee	27	19	12	15	15	88
P. H. Lehmann ..	Black loam, Mallee fringe	31	17	13	11	15	87
E. Parsons ..	Sandy loam, Mallee	25	17	13	15	15	85
Geo. Clyne ..	Black clay loam	32	15	15	8	15	85
F. R. Kinghorn ..	Red loam ..	32	14	11	12	15	84
S. E. Kent ..	Black clay loam	29	17	10	14	14	84
D. Leeke	Black, red patches	26	17	14	14	13	84
T. Pearce, No. 2 ..	Black clay loam	27	16	14	13	13	83
C. A. McKenzie ..	Black clay loam	25	16	9	14	14	78
T. G. Leeke ..	Sandy loam, Mallee	20	15	12	15	14	76
F. R. Kumnick, No. 1 entry	Red clay loam	21	19	10	12	14	76
F. R. Kumnick, No. 2	Red clay loam	22	13	13	12	12	72
Parkinson Bros. ..	Black clay loam, red patches	20	15	6	9	11	61

NOTE.—The figures for yield are not expressed in busels per acre. The actual yields are considerably above those mentioned. The differences between the yields, however, indicate the apparent differences in yield in bushels per acre.

Results.

SECTION II.—FOR BEST 100 ACRES OF WHEAT, 1921, GROWN ON FALLOW WHICH WAS JUDGED 1920.

Prize for Highest Aggregate of Marks Awarded for Crop and Fallow.

In this section the points for the fallows were awarded last year. The entry which secured the highest aggregate award for the crop and fallow over the two years was that of Messrs. M. E. Schultz and Sons (Entry No. 2). While this was not the heaviest crop shown in the section, nevertheless it scored consistently in the subdivisions purity, absence of disease, absence of weeds, and evenness.

It was grown on summer-fallowed land which had been thoroughly worked. Sixty-nine lbs. of seed and 93 lbs. of superphosphate were used. The sowing was made at the end of June. Federation was the variety used, and it was the product of hand selection, as in Messrs. M. E. Schultz and Sons' entry No. 1.

The second prize crop and fallow, that of Mr. W. W. Witney, was grown on the fallow that was awarded highest points last year. There

were patches of soil in the paddock containing a high percentage of limestone. On these the crop was comparatively light. Some points were lost on the score of disease.

Mr. Coutts' crop of Federation was third on the list. The paddock, Mallee fringe, was well worked, and sown at the end of June and early in July with 75 lbs. of seed and 112 lbs. of superphosphate to the acre.

The heaviest crops entered in the section were those of Messrs. F. R. Kinghorn, P. H. Lehmann, and Lamonte Bros. (No. 2 entry). The crops of the two first named were entered in the open section, and have already been described. The entry of Messrs. Lamont Bros. was a fine crop of Yandilla King and Federation. Points were deducted because of the presence of musk weed. Seventy-five lbs. of wheat with 90 lbs. of superphosphate per acre were sown. The crop was put in with a combined spring-toothed cultivator drill late in June. Yandilla King was chosen for the seeding of the part of the paddock infested with musk, because it is a tall grower and likely to assist in choking the weed. It played its part satisfactorily.

Details.

SECTION II.—FOR BEST 100 ACRES WHEAT, 1921, GROWN ON FALLOW JUDGED 1920.

Prize for Highest Aggregate in the Two Years.

Name.	Soil Type.	Yield.	Purity.	Disease.	Weeds.	Evenness.	Total for Crop.	Total for Fallow, 1920.	Grand Total.
Maximum Points ..	.. .. ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
M. E. Schultz and Sons (No. 2)	Loam, Mallee fringe	27	18	14	15	14	88	91	179
W. W. Witney ..	Black clay loam	25	14	8	15	14	76	99	175
Geo. Coutts	Sandy loam ..	28	19	11	10	12	80	92	173
E. M. Forster ..	Reddish loam ..	22	16	8	14	15	75	96	171
Lamonte Bros. (No. 2)	Black clay loam	30	15	12	8	14	79	92	171
F. R. Kinghorn ..	Red loam ..	32	14	11	12	15	84	86	170
J. H. Gove	Red clay loam	27	16	13	10	14	80	87	167
Roy King	Black clay loam	21	16	10	12	13	72	94	166
P. H. Lehmann ..	Black clay loam	31	17	13	11	15	87	75	162
Arnold and Gove ..	Reddish loam ..	28	15	8	13	13	77	75	152

Results.

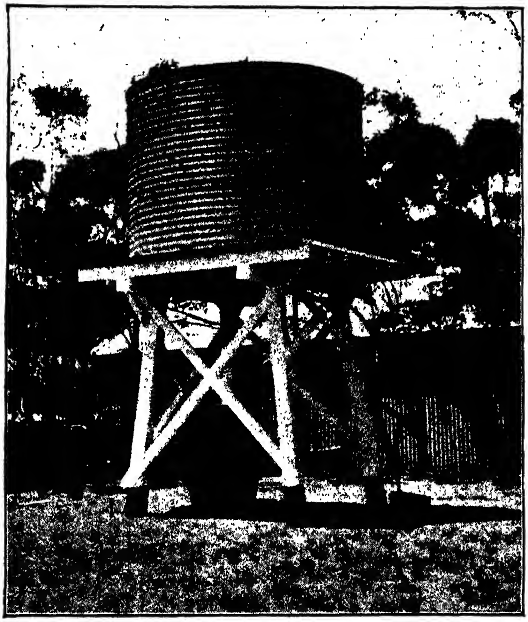
SECTION III.—BEST 100 ACRES FALLOW.

In judging the fallows more difficulty than usual was experienced in arriving at decisions, owing to rains which fell a week or so prior to judging. Practically the whole of the fallows were therefore temporarily highly charged with moisture, irrespective of cultural treatment given. Reliance had therefore to be largely placed on the character of the mulch, and on the condition with respect to weeds and cultivation, in order to separate the competitors.

A fine piece of fallow entered by Messrs. Parkinson Bros. was placed first. The soil was a blackish clay loam with a few red patches. Full marks were scored practically in each subdivision. In appearance the fallow showed all the fine points of high-class workmanship. There

was a good 2½ inches of mellow mulch on top, overlying a moist, firmly consolidated seed bed. The cultivation had been done thoroughly, as evidenced by the level character of the seed bed throughout the field. The red patches were in good condition. Messrs. Parkinson Bros., who are new-comers to the district, have not been slow to profit by local experience.

The bulk of this exhibit was summer-fallowed. In the first instance the land was scarified to a depth of 3½ inches in April. Early in July it was scarified again to about 3 inches. The scarifying was repeated early in September to about 2½ inches. Subsequently a portion was



Neat Tank Stand. (Mr. W. Altman, Warracknabeal.)

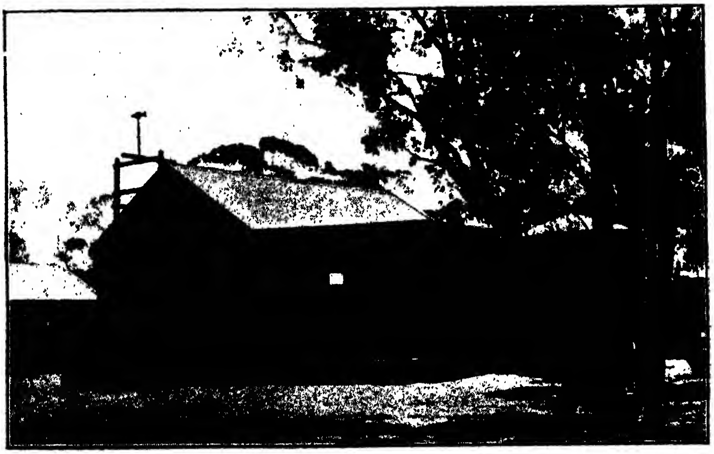
spring-toothed in mid-September and the rest harrowed. The whole was then again harrowed early in October and again in mid-November. The spring-tooth was used on a portion foul with weeds prior to the final harrowing. It will be noticed that at no time was the fallow ploughed. The winter-fallowed portion was, however, ploughed.

The fallow placed second was that of Mr. Geo. Coutts. The soil was a red loam with some clay patches. Some of these were not in quite as good order as it was possible to have them, hence a slight loss on points; otherwise the fallow was perfect. The cultivation had been thorough. The land was ploughed in August and harrowed immediately afterwards. Subsequently it was scarified and harrowed in September. In November the spring-tooth cultivator was used.

Another good fallow was Mr. Altman's No. 1 entry. The only points deducted were for somewhat uneven depth of the loose surface

soil. This was summer fallow, scarified in April, re-scarified in July, again in August, again in October, and again in November. Finally the paddock was harrowed.

Mr. H. McLean's entry was sandy loam. The whole of the work had been done with the scarifier and the spring-toothed cultivator. This paddock, which is easily worked, was lightly spring-toothed in March. In July it was scarified, and later on it was spring-toothed three times—once in August, once in September, and again in October.



Useful Type of Mouse-proofed Oat Silo. (Mr. W. Altman, Warracknabeal.)

Details.

SECTION III.—BEST 100 ACRES FALLOW.

Name.	Soil Type.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Maximum Points ..	.. .. ..	25	25	25	25	100
Parkinson Bros. ..	Black clay loam, red patches	25	25	24	25	99
Geo. Coutts ..	Red loam ..	25	24	24	25	98
W. Altman, No. 1 ..	Red loam ..	25	24	25	23	97
H. McLean ..	Sandy loam ..	25	24	24	24	97
Geo. Clyne ..	Clay loam ..	25	24	24	22	95
W. Altman, No. 2 ..	Red loam ..	24	22	25	23	94
J. H. Gove ..	Black clay loam, red patches	24	22	24	23	93
F. R. Kinghorn ..	Reddish loam ..	25	25	21	22	93
J. McLean ..	Black loam ..	24	23	23	22	92
D. Leeke	Loam	23	24	21	23	91
A. Arnold ..	Loam	23	21	25	21	90
T. Pearce	Black clay loam ..	24	20	23	22	89
F. R. Kumnick ..	Red clay loam ..	19	18	24	19	80

Scarifier versus Plough.

Over the greater portion of the Wimmera the term fallowing implies preparation of the land with a plough and subsequent cultivation with implements of lighter draught, such as scarifier, spring-tooth, and harrows. In some instances where the soil is sufficiently loose, especially after a dry season, the plough is dispensed with and the scarifier relied on to do the heavy work. In the northern portion of the Wimmera where the soils are somewhat shallower and more easily worked than elsewhere there are numbers of farmers who are now relying entirely on the scarifier and dispensing with the plough except for occasional use. Numerous instances occur near Warracknabeal, and some have already been quoted.

There is no doubt that the practice is one saving in labour, but it is difficult to decide whether the crops are as prolific as those grown in the ordinary way.

Comfortable Farm Residence. (Mr. F. Hayter, Warracknabeal.)

One thing noticed was that fallows prepared entirely with the scarifier have, as a rule, a somewhat shallow moisture, conserving dust mulch, it being difficult to maintain the original depth, especially when the land is well sheeped. But notwithstanding that, two of the three best fallows in this competition were prepared without the aid of the plough. Of course, on land where weeds are vigorous, the plough must be resorted to.

Next year the crops grown on these variously treated fallows at Warracknabeal will afford interesting comparisons.

Drilling.

There can be no question of the rapid increase in the number of drills of the combined cultivator type in the Wimmera. Hundreds of them have been placed in use there since 1917. Their popularity is accounted for by the fact that the final cultivation of the fallow and

the seeding of the crop can be done by one man in one operation. Of course, if the land is very foul with weeds, the scarifier must be used as well. Originally there was some doubt as to whether crops as clean and as heavy as those grown in the ordinary way could be produced. But that point is now definitely settled, and it has even been argued that better crops may be grown. It is said that this is because the combined drill sows the grain on the firm soil underneath the loose mulch. This point, however, cannot be settled without careful test, but it is a fact that some of the heaviest crops in the farm competitions during the past few years have been sown with the combined drill.

An older variation of the type of drill mentioned is the "box" plough—a grain distributer fitted to a skim plough. This, however, is not extensively used.

Numbers of farmers are using the cultivator part of the first mentioned drill to work up their fallows. The winning crop in the soldiers' section of the Beulah Competition was so treated.

Farmers' Field Day. (Govt. Experimental Plots, Warracknabeal.)

Working the Fallow when Dry.

It is the common experience of Wimmera farmers to find that if the fallowed land is worked over with heavy implements when it is dry, it afterwards becomes difficult to consolidate properly, and that the "take-all" disease may appear when the crop is sown. Dry-working is, therefore, scrupulously avoided, and the ground rarely touched until it is in a moist condition. But it frequently happens, especially on fallows well tramped with sheep, that the soil cracks badly in summer, and, consequently, loses moisture. Farmers are, therefore, in a dilemna; shall they harrow the fallow in the dry state, and close the cracks, or shall they wait for rain? Two cases can be quoted where the land cracked in the summer last year, and where a light harrowing was given without any ill-effects. Indeed, the harrowing was probably of great benefit to the subsequent crop.

Mr. Walter E. Dahlenburg, of Nhill, had a paddock of his fallowed land crack badly, and he decided to harrow it. The crop was a very heavy one, and showed no signs of "take-all." Similarly, Mr. P. H.

Lehmann, of Katyil, harrowed his fallow dry, and the crop suffered no ill effects, indeed, it was, apparently, considerably benefited.

It would appear then that, at any rate, light implements may be used on fallows in a dry state to prevent cracking, with benefit to the subsequent crop.

A Fine Orchard.

A report of the Warracknabeal district would not be complete without reference to a fine orchard attached to the wheat farm of Mr. F. Hayter. There are 2 acres of well-grown fruit trees, consisting of

A Productive Citrus Grove. (Mr. F. Hayter, Warracknabeal.)

oranges (Washington Navel do best), vines, and soft fruits. The orchard has rarely received artificial watering, yet the trees show vigorous unchecked growth, and bear as well as those in recognised fruit-growing districts. The soil is loamy. It is probable that the orchard receives some drainage water from the surrounding country, but, undoubtedly, the thorough cultivation given is of great assistance in reducing evaporation to the minimum.

* * * * * * * *

In conclusion, I desire to thank the Secretary, Mr. W. Candy, the President, Mr. F. Hayter, and members of the society for their cordial assistance and co-operation during the work of judging.

NHILL CROP AND FALLOW COMPETITION.

Report of the Judge, I. M. Tulloh, Field Officer, Department of Agriculture.

Since the inauguration twenty years ago of farm crops and fallow competitions by the Nhill Agricultural and Pastoral Society, the position of Secretary has been filled by Mr. C. H. Towns, and it must be very gratifying to him and the officers of the society to note the increasing interest taken year by year in these competitions. A record number of entries was received last year, and the number of entrants during this season exceeded last year's total by six. Further, the growing keenness of competitors, and their general adoption of the soundest methods, is resulting in a large number of entries of high standard being offered for inspection.

The Season.

The season has been an exceptionally favorable one. The rainfall for the year, 13.10 inches up to the end of November, though below the average, was notable for its opportune distribution. Crops grown on summer fallow had roughly 20 inches of rain during the fallow period, and on winter fallow 16 inches, while approximately 8½ inches fell during the growing period of the crop. The mild temperatures during early winter enabled crops to get a good start. Favorable growing weather prevailed right through the season, and the cool spell in early December should result in the grain filling well.

Close muggy weather in November caused rust to make headway in many crops. This, however, was fortunately checked by more seasonable weather before the fungus had affected crops to any serious extent.

Results.

SECTION 1A.—BEST WORKED AND MANAGED FARM OF AN AREA OVER 100 ACRES.

(Judged on a scale of points furnished by the society.)

There were three competitors in this section, *i.e.*, Messrs. C. H. Roediger, Julus Reichelt, and O. H. Lienert, and the points were awarded as follows:—

Name of Competitor.	Cropping System, Cultivation, Rotation, and Manure.	Crops, including Wheat and Oats.	Fallow.	Horses.	Sheep.	Cattle.	Pigs.	Poultry.	Equipment, Machinery, Implements.	Boundary and Subdivision Fences, Gates, and Sheep Yards.	Orchard and Vegetable Garden.	Water Storage, Accessibility to Stock, Ease of Watering, and Location.	Dwelling and Outbuildings.	Reserve of Fodder.	Tree-planting.	Farm and Stock Insurance.	Total.
Maximum Points	**35**	**20**	**20**	**25**	**20**	**10**	**5**	**5**	**20**	**20**	**10**	**45**	**20**	**20**	**5**	**5**	**285**
C. H. Roediger	32	15	15	17	17	3	2	4	19	17	4	43	17	16	4	4	229
Julus Reichelt	30	14	17	24	7	9	4	3	20	14	7	30	15	15	3	2	214
O. H. Lienert ..	29	14	13	17	20	6	3	4	19	12	6	33	12	14	2	2	206

The winner, Mr. C. H. Roediger, had a very complete farm, with a total area of 1,000 acres. Of this, 200 acres were sown with wheat, 190 acres with oats (40 acres in fallow), and 20 acres with barley, while 5 acres had been put in with Sudan grass as summer pickings for the milking cows and occasionally for other stock. There were 280 acres of well-kept fallow. The rotation practised is the four-year one:—Fallow, wheat, oats, pasture. Ploughing is done to a depth of from 3½ to 4 inches on the black land, and lighter on the red soil, of which there are several paddocks.

Mr. Roediger has a very complete equipment of farm implements and machinery, all of which was in a good state of repair. The farm is subdivided into useful-sized paddocks, and care has been taken to give easy access from one field to another. All gateways are 16 feet wide, closed with two 8-ft. gates, which were in good order and well hung.

One of the outstanding features was the complete watering system. At a depth from 75 to 100 feet, an abundant supply of water is obtained. Two wells 100 feet deep have been put down—one at the homestead, and another conveniently situated to serve the more distant paddocks. The water from these is raised by wind-mills to overhead tanks—one with a capacity of 3,000 gallons, and another of 2,000 gallons. From these an extensive system of water-pipes has been laid to troughs which serve every paddock on the farm. To prevent corrosion, these troughs, which are of galvanized iron, have been packed inside with cement. This water has been found unsuitable for the garden, and a supply for this purpose is obtained from a 2,000-yard dam near by—also provided with a wind-mill.

Rain water, for which there is a storage capacity of 6,000 gallons, is laid on to the house; while convenient taps have been placed at the sheep-dip, and other points around the out-buildings.

A fine avenue of sugar gums leads up to the homestead, while others have been planted in suitable positions around the farm buildings. The dwelling, which is surrounded by a large and neatly-kept garden, is artistically designed, and is supplied with acetylene gas, and has a large semi-detached cellar 20 feet by 10 feet.

The farm buildings are compactly arranged, and are of a very serviceable type. They comprise a 16-stall stable and two loose-boxes. Included in the stable building are the engine-room and chaff house, from which the chaff is wheeled in a large barrow down a passage, whence it is fed into the feed boxes. The barrow is built large enough to hold enough chaff for one feeding up.

At the end of the stables, under the same roof, is the shearing-shed, fitted with two stands, with the necessary yards, drafting pens, and dip attached.

There is a large roomy implement shed, a galvanized-iron barn 32 feet by 26 feet, with a solid boarded floor. On one end of the barn, two oat bins have been built, each with a capacity of 500 bags. These are filled each year, and held in reserve until the succeeding oat crop is assured, when they are emptied, and the oats sold and replaced by the new season's grain.

Near the barn, a fine buggy shed has been built, with wide sliding doors at each end. In addition, there is a well-equipped blacksmith's shop—a necessary adjunct to every farm.

A disused stripper, and old iron tanks, have been converted into mouseproof store-boxes, in which are kept canvasses, bags, rugs, &c.

In addition to the oats mentioned above, Mr. Roediger has, as a reserve, 100 tons of oaten hay, 20 tons of oaten straw, and 10 tons of self-sown hay. The oaten hay was stored in two 50-ton mouseproof stacks.

The homestead, farm buildings, stationary machinery, and crops, are covered by insurance.

Mr. Roediger is to be congratulated on the appearance of his farm, of which the whole tone is characterized by the old maxim "A right place for everything, and everything in its place."

On Mr. Reichelt's farm of 960 acres, 240 acres had been sown with wheat, 40 acres with oats, and 400 acres were in fallow. The practice

Neat Buggy Shed and Barn. (Mr. C. H. Roediger.)

here is to crop practically half the farm each year—a two-year rotation, "fallow and wheat."

Fallowing for this season's crop had to be considerably curtailed, as at the time of ploughing over 800 sheep were being carried, and the land had to be left in grass; so that only a little more than half the usual area of wheat is being grown this year. On this there was a well-grown crop of Federation, but it contained a number of wild oats, especially in one of the paddocks. The fallow was in splendid order, the exception being a few red patches, which had evidently been caught at a difficult time, and consequently did not work down satisfactorily.

The equipment of implements and machinery was very complete.

Mr. Reichelt believes in quick cultural operations, and to accomplish this uses wide-cutting implements and large teams. The spring-tooth is used in preference to the harrows for lighter workings on the fallow. Two of these implements (each 7 ft. 6 in.) are attached to a 12-horse

bar—one slightly in advance of the other—and, controlled by one driver, work very satisfactorily.

Many handy home-made devices were noticed on the farm.

A good permanent water supply is obtained from a 76-ft. well, fitted with a wind-mill, and a 7,000-gallon overhead tank. For household use the rain water is stored in a 21,000-gallon cement underground tank. It is pumped from here to an overhead tank, from which pipes are laid to convenient places throughout the dwelling.

Mr. Reichelt's home is an acquisition to the district. Built of cement concrete (4 parts stone, 3 sand, and 1 cement), with a tiled roof. it contains eleven large and conveniently-arranged rooms, with lofty walls, and is surrounded by a broad verandah. An extensive garden has been tastily laid out around it, and has been planted with decorative shrubs at the front and sides, while the remainder contains 100 young fruit trees, and a well-stocked vegetable garden. The whole homestead is surrounded by a shelter-belt of sugar gums.

An Attractive Home. (Mr. O. H. Lienert, Lorquon.)

The stables, however, are not well improved, and the chaff-cutter and chaff-house are not conveniently situated. The reserve of fodder comprised two stacks of hay (160 tons), and a stack of wheaten straw, and 80 bags of oats stored in a tank oat bin.

All crops, stables, and stationary machinery were insured.

On Mr. Lienert's farm of 880 acres, 300 acres were under wheat, 70 acres under oats, and 40 acres under barley, while there were 170 acres of fallow. The wheat crop was mainly Yandilla King and Federation, with a smaller area of Dollar. Taking into consideration the lighter nature of some of the land, the crops were very creditable.

Mr. Lienert has recently introduced a merino stud, and, in addition, is carrying upwards of 400 merino sheep.

As on the two previous farms, a very complete set of farm machinery was met with.

A large implement shed, 80 feet by 20 feet, comfortably housed all implements requiring protection from the weather. Included in the out-buildings, also, are an up-to-date shearing shed, with three stands, and very complete yards attached; a good serviceable barn; a nicely modelled motor and buggy shed; and a well-stocked blacksmith's shop. The stables, however, are not up to date, and the farm buildings are rather scattered.

Mr. Lienert has in reserve 120 tons of hay, 100 tons of which are of wheat, and 20 of oats. An oat bin, which holds 500 bags, contained at the time 80 bags, a large quantity having been used during the season.

The house and all crops were covered by insurance.

One of the outstanding features on these farms was the large and complete stock of implements and machinery carried, and one might be justified in questioning whether the areas of the farms admitted such

Mr. C. P. Dahlenburg's Winning Crop of Federation.

a large outlay of capital in this direction. It will be seen by the award of points that on each of the farms there were features of outstanding merit. The winner, Mr. Roediger, however, scored consistently well in nearly all departments, but he lost points for cattle, pigs, and orchard—which latter had been destroyed by opossums.

SECTION 1.—BEST EXHIBITED HALF OF FARMER'S WHEAT CROP, NOT LESS THAN 75 ACRES.

There were fifteen competitors in this section, and all the crops shown were exceptionally good. The two leading crops, both of Federation, that of Mr. C. P. Dahlenburg (the winner) and that of Mr. Robert Blackwood (who secured second place), were the finest I have ever seen. Both were awarded the maximum points for yield. Mr. Blackwood gained a point for purity, and another for freedom from disease. Mr. Dahlenburg, however, led by two points for freedom from weeds, and gained another in evenness, giving a total of 93; thus winning from Mr. Blackwood by one point.

Mr. Blackwood's crop, sown early (latter end of May), was tall, and stood erect. It was very dense, and exceptionally well headed. Mr. C. P. Dahlenburg's crop was sown a month later, and consequently was much shorter. Like Mr. Blackwood's, it was very dense, and beautifully headed, while the whole field presented a practically level surface, solidly packed, and almost entirely free from weeds.

Mr. W. E. Dahlenburg's crop was of Federation and Dollar. This also was a splendid crop, and very free from foreign varieties.

Worthy of special mention was the crop exhibited by Mr. C. F. Reichelt, whose land is considerably lighter than that of the leading competitors. Yet this crop was placed only three points behind the winning one. It will be seen that, though not such a heavy yielder, this crop scored exceedingly well on other points.

As stated previously, all the crops in this section were exceptionally fine. Those of Mr. A. W. Goodwin and Mr. Peter Bone, jun., were especially good.

AWARD OF POINTS.—SECTION 1.

Name.	Yield.	Purity.	Freedom from Disease.	Freedom from Weeds.	Evenness.	Total.
Maximum Points	**40**	**20**	**15**	**15**	**10**	**100**
C. P. Dahlenburg (Winniam East)	40	16	13	14	10	93
Robert Blackwood (Kiata East) ..	40	17	14	12	9	92
W. E. Dahlenburg (Salisbury) ..	37	18	13	13	9	90
C. F. Reichelt (Lorquon West) ..	36	18	14	13	9	90
A. W. Goodwin (Kaniva) ..	37	18	12	13	9	89
Peter Bone, jun. (Kiata East) ..	35	18	14	13	9	89
A. G. Dahlenburg (Winniam East)	37	16	11	14	9	87
Julus Reichelt (Lorquon) ..	33	16	14	12	8	83
A. E. Bond and B. Hegarty (Yanac)	35	17	11	12	7	82
James Moulden (Kiata)	35	17	12	11	7	82
Johan Reichelt (Lorquon) ..	34	17	13	11	7	82
Alfred Wohlers (Winniam) ..	35	16	10	12	8	81
J. B. Marshall (Lorquon) ..	34	17	10	12	8	81
Creek Bros. (Winniam)	32	16	11	12	8	79
O. H. Lienert (Lorquon) ..	33	13	13	12	8	79

Mr. C. P. Dahlenburg's crop was grown on fallow which had been very thoroughly worked. A part had been summer fallowed, and the remainder winter fallowed. The summer fallow was ploughed in March, and scarified during the second week of July. The winter fallow was ploughed at the latter end of July, and harrowed four days later. It was all then given the following treatment:—Worked with the combine during the second week of October, and then crossed; again worked with the combine and crossed early in November; harrowed a week later, and again in March. With the harrows working a day or so behind, it was put in with the combine during the third week of June; 75 lbs. of seed, and 120 lbs. of manure were sown per acre.

Mr. Blackwood fallowed his paddock during February and March. The next working was in June, when it was scarified 3 inches deep. It was then spring-toothed across in September, and crossed again in October, and harrowed after rain in November. With the cultivator working ahead of the combine, it was sown with 75 lbs. of seed and 112

lbs. of manure during the last week of May—a team of harrows working close behind.

A further discussion of the crops in this section appears in Section 8.

SECTION 2.—BEST CROP OF 100 ACRES ON MALLEE LAND—FRINGE LAND DEBARRED.

Name.	Yield.	Purity.	Freedom from Disease.	Freedom from Weeds.	Even-ness.	Total.
Maximum Points	**40**	**20**	**15**	**15**	**10**	**100**
C. F. Reichelt (Woorak West) ..	30	16	13	14	8	81
J. B. Marshall (Lorquon) ..	29	16	13	13	8	79
F. W. Reichelt (Allanby) ..	32	15	9	10	8	74

Crop of Penny. (Mr. R. Blackwood.)

Mr. C. F. Reichelt's crop of Federation was grown on sloping land along the edge of a water-course. Heavy rain after seeding caused the grain to burst, and 60 acres had to be re-sown. The crop was very free from weeds, and was exceptionally well headed. Ploughing was done in early winter, and the ground was sparingly worked with the spring-tooth during the spring, care being taken not to work the surface too finely. It was spring-toothed again after an inch of rain in February. Sixty pounds of seed and 80 lbs. of manure per acre were put in with the combine at the latter end of May, and harrowed four days later. When re-sowing 60 acres, a further 36 lbs. of superphosphate per acre was allowed. Except for several patches which had been thinned owing to water soakage from the higher slopes, the crop was dense for this class of soil.

Mr. Marshall's crop, also of Federation, was grown on land which had been ploughed during July and harrowed immediately after. It was then left untouched till March, when it was cultivated with the

spring-tooth, and after a germination of weeds in April, it was crossed with the same implements. It was drilled with a combine early in May, sowing 75 lbs. of seed and 80 lbs. of manure per acre. About 17 acres were put in on the first day's sowing, after which the work was held up for a week owing to heavy rains. There was a difference of approximately a bag per acre in favour of the first day's sowing. The whole crop was nicely grown, and fairly free from weeds, while the only diseases in evidence were flag smut and a little rust.

Mr. T. W. Reichelt's crop was heavier than either of the two preceeding ones, but points were lost on account of the presence of weeds, while stinking and flag smuts were prevalent. This crop was sown at the end of June—considerably later than the other two, and heavier quantities of seed and manure were used—63 lbs. and 90 lbs. respectively per acre.

SECTION 3.—BEST BLACK FALLOWED LAND, NOT LESS THAN 100 ACRES.

(All competitors' fallow to be shown.)

There was again a large field of competitors in this section, *i.e.*, 13, and of this number, 11 were awarded points from 93 upwards. From this it will be gathered that the fallows were exceptionally even, and of a high standard.

The task of separating them was made more difficult by the occurrence of heavy rain during the judging week. This was very unevenly distributed over the district, and greatly interfered with the tests for moisture, so much so that it was found necessary to award all the fallows the maximum points in this respect. Thus no competitor gained any advantage over another whose fallow may have been inspected before the rain commenced, or where less rain had fallen. In awarding points for the various fallows, a number of which were well nigh perfect, points had necessarily to be deducted for the smallest details.

AWARD OF POINTS.—SECTION 3.

Name.	Moisture.	Mulch.	Freedom from Weeds.	Consolidation.	Cultivation.	Total.
Maximum Points	**20**	**20**	**20**	**20**	**20**	**100**
W. E. Dahlenburg (Salisbury) ..	20	19	20	19	20	98
Petes Bone, jun. (Kiata East) ..	20	20	18	19	19	96
H. E. Dahlenburg (Winniam East)	20	20	20	·18	18	96
R. Blackwood (Kiata East) ..	20	19	20	18	19	96
Julus Reichelt (Lorquon) ..	20	19	19	19	19	96
C. F. Reichelt (Woorak East) ..	20	19	18	19	19	95
C. P. Dahlenburg (Winniam East)	20	19	20	18	18	95
Johan Reichelt (Lorquon) ..	20	17	20	19	18	94
A. G. Dahlenburg (Winniam East)	20	19	17	19	18	93
A. W. Goodwin (Kaniva) ..	20	18	18	18	19	93
O. H. Lienert (Lorquon) ..	20	16	14	16	15	81
F. W. Reichelt (Allanby) ..	20	16	11	16	16	79
James Moulden (Kiata) ..	Withd	rawn.				

The winner, Mr. W. E. Dahlenburg, showed a fallow that was practically perfect. One half of this had been summer fallowed, and the other half winter fallowed. The summer fallow had been ploughed

in March, scarified early in July, and again in September. It had received three harrowings—one in October, the next in November, and the last after a heavy rain just prior to judging. The winter fallow was ploughed in July, and harrowed early in August, a week after ploughing. It was scarified in early September, and had been harrowed at the end of September, and received two more harrowings at the same time as the summer fallow.

There was no apparent difference between the summer and winter fallow, all of which was in beautiful condition. The underlayers were well consolidated, and contained abundant moisture, while the mulch was in fine tilth, and weeds were entirely absent.

Harrowing after the heavy rains early in December was an asset to this fallow. Mr. Dahlenburg seized the opportunity of doing this while hay-making was held up through unfavorable weather, and thus prevented the mulch from settling down—a feature which was noticeable on a number of fallows on which heavy rain had fallen.

Mr. Bone's fallow was ploughed in March, and scarified during the second week of July. It was worked again with the same implement at the middle of August, cultivated in September, and again in October. The mulch in this fallow was in perfect condition, very regular in depth, and worked to a very even tilth. Points were lost owing to the presence of young "paddy melons," which, though their growth here may be attributed to the moist condition of the fallow, must at the same time be regarded as an exceedingly troublesome weed.

A portion of Mr. H. E. Dahlenburg's fallow was ploughed in March and the remainder early in August. The summer fallow was harrowed immediately after ploughing. It was then scarified in July, and harrowed a week later. This treatment was repeated in September, and again in November. The winter fallow was harrowed and cross-harrowed immediately after ploughing. It was treated similarly to the summer fallow in September and November, but received an extra harrowing at the end of the latter month.

Like Mr. Bone's fallow, the mulch was very evenly put on to a depth of 2½ inches. About 30 acres, however, had been flattened by a heavy rain storm, and would have benefited by harrowing.

Mr. Blackwood showed all summer fallow, of which there were 335 acres. The 100 acres entered in this section had to be re-ploughed at the beginning of August owing to the strong growth of weeds, attributed to the fact that two oat crops had been grown in this paddock in succession, previous to ploughing. Immediately after re-ploughing, during which it had been harrowed with a harrow-leaf attached to the plough, it was cross scarified. It was then harrowed, and cultivated with the spring-tooth early in November. This fallow was free from weeds, but showed variations in consolidation.

Mr. Jules Reichelt's fallow was ploughed in August, then harrowed three times at short intervals, crossing the previous working each time. It was rolled and then cultivated during October, one half was then rolled again, when it was all re-cultivated. This was an exceedingly good fallow, scoring very consistently under all heads, for which points were awarded.

Mr. F. W. Reichelt was unfortunate in having a severe illness, which prevented him from working his fallow; while Mr. Lienert lost points

mainly through the presence of large patches of a weed of the Solanum family; it had a thorough hold of the fallow.

SECTION 4.—THE BEST RED FALLOWED LAND, NOT LESS THAN 100 ACRES.

(All competitors' fallow land to be shown.)

There are a large number of farms throughout the district which include a big proportion of red land. This is considered the most difficult class of land that wheat-growers have to contend with, and from the time of fallowing until the crop is well above ground, it causes many anxieties to the farmer.

Ploughing is the greatest difficulty, and the success here is mainly dependable on the season. If the soil is too wet at the time of ploughing, the sods set into hard lumps, which defy future attempts at breaking them down. During a prolonged winter, fallowing has to be postponed until the land is dry enough to get on to. This invariably means a short fallowing season, for the warm spring days quickly evaporate the moisture, and the ground sets into such a cementy state that the plough will scarcely touch it. Even when fallowing is carried out under favorable conditions, it is necessary to have a drag-harrow attached, or to follow the plough closely with the harrow, so that the sods may be somewhat broken down before drying out.

The winner in this section was C. P. Dahlenburg, with C. H. Roediger 2nd, and C. F. Reichelt 3rd.

Details of points awarded are as follow:—

AWARD OF POINTS.—SECTION 4.

Name.	Moisture.	Mulch.	Freedom from Weeds.	Cultivation.	Total.
Maximum Points ..	**25**	**25**	**25**	**25**	**100**
C. P. Dahlenburg ..	25	18	24	20	87
C. H. Roediger	25	18	24	19	86
C. F. Reichelt	25	17	17	16	75

Mr. Dahlenburg had fallowed during early July, with a harrow-leaf attached to the plough. The paddock was then cross-harrowed, and scarified at the latter end of August, and then fallowed again with the harrows. It was given a working with the combine in early October, and cross-harrowed at the end of the month. The fallow was very free from weeds, but the surface in many places had been broken down too finely, thus leaving it liable to be set down by heavy rain. A portion of sloping ground had been left with the combine surface, and in districts where red soil preponderates, such treatment is found most suitable for this class of soil. The ridges left by the tynes of the combine or the cultivator prevent the settling of the surface, and even after heavy rains the caps of the ridges can be worked across in the autumn, and an efficient seed-bed obtained.

SECTION 5.—BEST WHEAT CROP GROWN ON FALLOW LAND, THE FALLOW TO BE JUDGED ON POINTS 1920, AND THE CROP GROWN ON THIS FALLOW IN 1921.

The details of the points awarded to the fallows were issued in the report of the Crop and Fallow Competitions 1920, while the points awarded for the crops are detailed in Section 1, with the exception of Mr. C. H. Roediger's, to which the points allotted were:—Yield, 34; purity, 16; freedom from weeds, 14; freedom from disease, 12; evenness, 8. Total, 84.

TOTALS, FALLOW 1920, AND CROP 1921.

Name.	Fallow 1920.	Crop 1921.	Total.
Maximum Points	**100**	**100**	**200**
Robert Blackwood	98	92	190
W. E. Dahlenburg	99	90	189
C. P. Dahlenburg	94	93	187
A. G. Dahlenburg	96	87	183
A. W. Goodwin	91	89	180
Peter Bone, jun.	87	89	176
James Moulden	94	82	176
O. H. Lienert	92	79	171
C. H. Roediger	85	84	169
Crouch Bros.	90	Withdrawn	..

This section was very evenly contested. Though Mr. W. E. Dahlenburg led by one point on last year's fallows, Mr. Blackwood's splendid crop enabled him to win on the aggregate by one point; while Mr. C. P. Dahlenburg was very close up in the third place.

SECTION 6.—THE WHOLE OF FARMERS' FALLOW 1921, THE CROP ON THAT FALLOW 1922, FALLOW 1922, AND CROP 1923.

Name.	Moisture.	Mulch.	Freedom from Weeds.	Consolidation.	Cultivation.	Total.
Maximum Points	**20**	**20**	**20**	**20**	**20**	**100**
W. E. Dahlenburg	20	18	20	19	19	96
Robert Blackwood	20	19	19	18	19	95
C. F. Reichelt	20	19	18	19	19	95
C. P. Dahlenburg	20	19	20	18	18	95
Julus Reichelt	20	18	18	19	19	94
Peter Bone, jun.	20	19	17	19	18	93
H. E. Dahlenburg	20	19	17	18	18	92
A. W. Goodwin	20	17	18	18	19	92
O. H. Lienert	20	17	17	17	17	88

Mr. W. E. Dahlenburg's fallow totalled 290 acres, 100 acres of which were summer fallow, and the remainder winter fallow. The summer fallow had received the same treatment as that outlined in

Section 3; the balance of the winter fallow had been ploughed in July, harrowed in early August, cultivated in September and again in October, and harrowed in November, after a good fall of rain. Included in this was a number of red patches which had been well broken down without becoming too fine. The whole of this fallow was free from weeds and in splendid order, while a notable feature is that Mr. Dahlenburg worked the whole area with only one team.

Mr. Blackwood's fallow of 335 acres had all been summer fallowed, with the exception of a patch of red ground of 25 acres, which was too hard to plough before the winter rains. The working of 100 acres has been detailed under Section 3. The remainder, after ploughing in April with a harrow-leaf attached to the plough, was scarified early in July, crossed with the spring-tooth three weeks later, again scarified during the middle of September, and spring-toothed in early November. Every acre of this extensive fallow had been worked with equal thoroughness. There were, however, variations in the degree of consolidation in the underlayers.

Mr. C. F. Reichelt had worked his fallow very thoroughly. Ploughing had been done during the first three weeks of July. It was then harrowed and cross-harrowed within a fortnight, when the following workings were given:—Spring-toothed in early August, and again at the end of the month, crossed with the same implement again at the latter part of September. It was then rolled and spring-toothed at the end of October. This fallow included a proportion of red ground which had been given special attention and brought into nice condition.

SECTION 7.—BEST WHEAT CROP GROWN ON RED FALLOWED LAND, NOT LESS THAN 75 ACRES.

There were but two entries in this section—Messrs. C. H. Roediger and Paul Staher.

Name.	Yield.	Purity.	Areedom from Disease.	Freedom from Weeds.	Evenness.	Total.
Maximum Points	**40**	**20**	**15**	**15**	**10**	**100**
Paul Staher	30	16	13	12	7	78
C. H. Roediger	30	17	10	12	8	77

The award of points shows that the contest was very even. Mr. Roediger gained a point on the absence of foreign varieties, but the presence of smut was mainly responsible for the loss of five points, and enabled Mr. Staher to win by one point.

Mr. Staher's crop was of Federation and Dollar, and was grown on a sloping red hill, inclined to be loamy in patches, and heavier on the lower slopes. It had been fallowed during July, harrowed and spring-toothed twice before harvest, harrowed after a heavy rain at the latter end of February. It was scarified in front of the drill during the middle of June, and harrowed and cross-harrowed immediately after. Eighty pounds of seed, and 112 lbs. of manure were sown per acre.

Mr. Staher believes in heavy sowings of both seed and manure on this class of land, and the tests which he has made this season strongly support his opinion.

A round of the drill was sown through the middle of his paddock with only ½ cwt. of superphosphate per acre. The crop here is much thinner, and by appearance several bags per acre lighter in yield than the remainder of the crop; while tests with different rates of seeding showed a marked difference in favour of the heavier sowings.

Mr. Roediger's entry consisted of three varieties:—Yandilla King, Penny, and Gallipoli. The seed of the two first varieties had been raised by Mr. Roediger, who selected 15 lbs. of seed of each from his crops three years ago. Typical heads of each variety had been selected and threshed out, and sown on small areas the first season.

This method of selecting seed is one which is easily applied, and from which very beneficial results were obtained by competitors in a

Oat Silo, built by Mr. J. B. Marshall, Lorquon, at a cost of £65.
(Holding 600 bags.)

" Selected Seed Competition," conducted by the Horsham Agricultural and Pastoral Society, in the seasons 1917-1919.

SECTION 8.—WHOLE OF FARMER'S FALLOW 1920, CROP 1921, FALLOW 1921, AND CROP 1922.

The test in this section, spread over three years, is a severe one, but must be regarded as probably the most educational competition on the society's schedule.

In favorable seasons, exceptionally heavy crops are occasionally grown on poor fallows, while in seasons with unusual weather conditions, a crop which had received indifferent treatment may win a prize. The competitions are conducted for their educational value, and the aim here is to circulate the methods by which the best crops are grown over a number of seasons. Hence, a summary of the cropping systems of the leading competitors in this section, taken after several of these

competitions have run their course, should prove of beneficial interest to all wheat-growers throughout the district.

The fallows of 1920 have been discussed in the report of that year, and those for 1921 are detailed under Section 6, execpting those of Messrs. C. H. Roediger and Johan Reichelt, to whom the following points were awarded (Mr. Reichelt's awards are placed first) :—Moisture, 20, 20; mulch, 17, 16; freedom from weeds, 20, 17; consolidation, 18, 16; cultivation, 19, 17. Totals: Mr. Reichelt, 94; Mr. Roediger, 86.

Mr. Reichelt's fallow was in splendid condition. It included a number of red patches, which had been specially catered for, and had been brought into nice order. Mr. Roediger's fallow contained some low-lying patches, which had presented many difficulties in working.

This section will be completed with the judging of the crops next year.

The positions of competitors are:—

Crop 1921.

Name.	Fallow.		Yield.	Purity.	Freedom from Disease.	Freedom from Weeds.	Evenness.	Crop Total.	Total.
	1920	1921.							
Maximum Points	**100**	**100**	**40**	**20**	**15**	**15**	**10**	**100**	**300**
R. Blackwood ..	98	95	39	17	14	12	9	91	284
W. E. Dahlenburg	99	96	36	18	13	13	8	88	283
C. F. H. Reichelt	97	95	34	17	14	13	8	86	278
Peter Bone, jun.	87	93	34	18	14	12	8	86	266
C. H. Roediger ..	87	86	32	16	11	13	8	80	253
Johan Reichelt ..	76	94	32	17	13	11	7	80	250
Crouch Bros. ..	90	With	drawn,	1921.					

Mr. Blackwood's crop totalled 255 acres, consisting of Federation, 145 acres; Penny, 55 acres; Dollar, 40 acres; and Graham, 15 acres. This had all been sown on summer fallow, which had been ploughed from 4½ to 5 inches deep in February and March. It was scarified 3 inches deep in June, and spring-toothed across in September, and again in October. It was harrowed after rain in November, and left till seeding time. Details of the cropping of 115 acres have been given in Section 1. Part of the remainder was scarified at the latter end of May, and crossed with the combine about the middle of June, sowing 75 lbs. of seed, and 112 lbs. of manure per acre. The balance was put in similarly three weeks later. It was all harrowed a day or two after sowing. The remarks on Mr. Blackwood's crop in Section 1 apply to the whole area, which can truly be described as magnificent.

Mr. Dahlenburg's crop was 217 acres, the whole of which was exceedingly fine, excepting a red loamy hill of 35 acres, where the crop was light, due to the nature of the soil. Wimmera Rye Grass seed had been sown here with the wheat, and this paddock is intended to be used solely as pastures in the future. The bulk of the crop was Federation, the remainder being 30 acres of Dollar. The latter, very even and dense, was a very attractive crop. The Federation was equally good, but hardly as even, owing to a number of light patches.

The Dollar was sown at the rate of 80 lbs. of seed and 120 lbs. of manure per acre, and the Federation with from 75 to 80 lbs. of seed and 112 lbs. of manure.

Mr. C. F. Reichelt's crop was sown on three classes of land:—Heavy black soil, fringe, and Mallee. The Mallee crop has been discussed in Section 2. On the heavy land, Federation and Dollar had been sown, and on the fringe country Federation and Gallipoli. This land had been winteer-fallowed, and had received six workings before harvest. Sowing was made with the combine at the latter end of June, harrowing both in front and behind. Seventy pounds of seed and 80 lbs. of manure were sown per acre.

The seed is changed each year from the Mallee to the black land, and *vice versâ*. Mr. Reichelt believes in deep sowing, 2½ inches if possible, as he considers a more even germination can be obtained in this way than by shallow sowing. The crops on the black land and the Mallee fringe were dense and even. The Gallipoli on the latter was very thick, and rather taller in the straw than is usual for this variety. It promised a heavy yield of grain, however.

SECTION 9.—FOR STIFF RED LAND—FRIABLE RED LOAMS DEBARRED.

Prize to be awarded for the highest aggregate of points for 75 acres of fallow 1921, and the crop on that fallow 1922. Points up to 5 per cent. of the total marks each year to be deducted, if necessary, if the red land contains fertile patches.

There were four competitors:—Messrs. Johan Reichelt, C. P. Dahlenburg, Julus Reichelt, and C. F. Reichelt. The entries of Messrs. Julus and C. F. Reichelt were withdrawn, as the soil, in both cases, did not comply with the rules in this section.

Mr. Julus Reichelt's fallow was a friable red soil, while Mr. C. F. Reichelt's was a red sandy soil, with occasional stiff patches.

Name.	Moisture.	Mulch.	Freedom from Weeds.	Cultivation.	Total.
Maximum Points ..	**25**	**25**	**25**	**25**	**100**
C. P. Dahlenburg ..	25	18	24	20	87
Johan Reichelt	25	17	22	22	86

Mr. Dahlenburg wins in this section. A detailed working of this fallow appears in Section 4.

Mr. Reichelt's fallow was more crab-holey than that of Mr. Dahlenburg, and thus was more difficult to work. During the winter Mr. Reichelt was unable to plough, as the crab-holes were filled with water. As spring approached, the banks commenced to dry out and set hard before the water in the depressions had got away. Ploughing was done during September with water still in many of the crab-holes, and some of the banks already in a cementy condition. It was harrowed twice immedately after ploughing—spring-toothed early in October.

harrowed and rolled a fortnight later. It was then harrowed, spring-toothed, and again harrowed—the worst half was rolled again, and then all harrowed. Since ploughing, this fallow had been given ten workings, and even then a number of patches were not broken down.

The obvious solution is levelling, but here there are difficulties to contend with. The nature of the soil makes is unsuitable for working with a leveller, while the depth of surface soil varies from 2 to 7 inches. Beneath this, a stiff clay is invariably met with, and it is considered detrimental to bring this to the surface. Hence, it is apparent that, on this class of land, only after some years of cultivation will it become sufficiently levelled by the workings of the implements to insure the main factor for success—"a quick ploughing at the opportune time."

SECTION 10.—FOR RETURNED SOLDIERS.

Aggregate of points for best fallow of 75 acres 1921, and crop on that fallow 1922.

Restricted to soldiers within the Lowan Shire, or within a 15-miles radius of Nhill if out of the Shire.

FALLOW 1921.

Name.	Moisture.	Mulch.	Freedom from Weeds.	Consolidation.	Cultivation.	Total.
Maximum Points	**20**	**20**	**20**	**20**	**20**	**100**
C. J. Creek	20	19	19	18	19	95
W. F. Beacom	20	17	20	18	19	94
Gordon Bone	20	18	18	19	18	93
H. V. Eastick	20	17	18	17	18	90
F. H. Eastick	20	18	16	17	18	89
C. J. Smith	20	17	14	18	16	85
E. H. Maynard	20	13	18	18	16	85
C. J. Beacom..	20	13	17	17	17	84

The winner this season was Mr. C. J. Creek, who exhibited a very fine fallow. It was on a heavy black flat, and had been summer-fallowed in March, and scarified in July. Half was then harrowed, and all was harrowed early in August. It was worked with the combine early in September, harrowed at the end of October, and again at the latter end of November. The surface was in a fine tilth, very free from weeds, the few present being young paddy melons recently germinated. The consolidation underneath was good, and fairly even, and the general condition was that mellow state which is attained only by using the right implement at the right time.

Mr. W. F. Beacom's fallow was on medium strong mallee soil. It had been ploughed in August, and harrowed immediately, spring-toothed in October, and again after heavy rain during the first week of December. This fallow had been brought into good condition for this class of soil. An effective mulch had been formed without breaking the soil

down too finely. Thistles had all been cut, and other weeds were entirely absent.

Mr. Gordon Bone's fallow was also a very good one.

Time of Sowing on Black Soil.

A glance over the details of seeding operations of the various crops shows that sowing commenced during the last week of May, and was practically all completed by the end of June. This is a contrast to the time of sowing on the Wimmera Plains, where sowing was not generally finished till the latter end of July.

On some of the lower black flats there is a danger, in a wet season, of the ground becoming too wet if sowing is delayed, but to the majority of the black land of the district this does not apply; and, provided that it proves profitable, there is nothing to prevent the later sowing, similar to that now generally practised on the "Plains." Here, fourteen years ago, sowing was religiously commenced about the middle of May. Gradually, however, the operation was delayed year by year, till, at the present time, sowing does not generally commence till mid-June, and is not finished till the latter end of July. It has been definitely proved on the heavy black soil at Longerenong College that plots sown during the third week of July yield, on an average over a number of years, several bushels per acre more than plots sown at the end of May, or during the first week of June.

During July, 1918, there was a long spell of wet weather, and sowing was so delayed that the last of the field areas at the College was not put in till the 20th August. On the last two days, 30 acres of Bunyip wheat were sown. This yielded 36 bushels per acre, and was the heaviest crop of that variety that has been grown at the College.

The increased yield resulting from late sowing is directly attributed to two main factors—

(*a*) An extra scarifying at a critical time.

(*b*) A shorter growing period.

(*a*) The extra scarifying at this time of the year has more importance than one would casually attach to another working of the fallow. After the autumn rains, which are usually expected at the latter end of May, the weeds germinate on the follow; these are effectively dealt with by scarifying, but it is after this working that weeds germinate more readily. When this second growth of weeds has come away, the fallow is cross-scarified and drilled, or both operations are carried out simultaneously with the combine, and a harrowing is usually given a day or two behind the drill. As well as dealing effectively with weeds, and insuring a clean crop, the double working at this time of the year, with plenty of moisture in the soil, probably stimulates the germination of spores of Take-All and Flag Smut, which die in the absence of the young wheat plants.

(*b*) The shorter growing period results in a shorter crop. There is always a danger of an early-sown crop making rank growth, especially if heavy quantities of seed and manure have been sown; but the late-sown crop, with its shorter straw, can be both heavily seeded and manured. The resulting crop will be well headed and dense, and it is to this degree of density that the increased yield is mainly due. The

short crop stands well at harvest time, and is easily taken off, whereas a rank crop goes down easily, and even though modern machinery may take it off successfully, it is a source of much trouble and loss of time in harvesting.

In a district where so many fine crops were found, it was rather surprising to find so few which were not affected with smut in a more or less degree. The seed of all the crops exhibited had been pickled with either bluestone or formalin. Either of these pickles is thoroughly effective, provided that the operation is done carefully. There is no advantage in using a pickle above the correct strength (1½ lbs. of bluestone to 10 gallons of water, or 1 lb. of formalin to 40 gallons of water), and, indeed, this practice only injures the seed to no purpose.

In order to kill the smut spores, it is necessary that they be saturated with the pickling solution. Where the seed is pickled in butts, it occasionally happens that some of the balls are still intact, and the solution does not penetrate to the centre. The butts are tossed about in carting to the paddocks, the outer spores on these balls are rubbed off, leaving those exposed which had not come in contact with the pickle. Many grains are thus re-infected from this source. A point which some competitors omitted was to pickle the bags also. This is a common source of re-infection. As the bags are being filled in the harvest field, the smut balls, being lighter than the grain, run to the outside of the bag, where they become broken in handling, and are held on the inside of the bag. If the crop the previous year has been badly infected with smut, it is a wise precaution to disinfect the drill with formalin solution.

Since the smut balls are lighter than the pickle, the surest method of pickling is obviously that of pouring the seed into the solution. This allows all the smut balls to rise to the surface, when they can be skimmed off. There are several pickling machines on the market specially designed for this method.

In conclusion, I would like to thank the officers of the society, particularly the Secretary, Mr. C. H. Towns, for the excellent and thoughtful arrangements made in connexion with the judging, and to express my appreciation to the competitors, who so warmly extended their hospitality.

Any man starting in the dairy cattle business cannot afford to purchase anything but a good pure-bred sire. His breeding herd soon comes to the level of the bulls he uses rather than of the dams or foundation cows. Only 6¼ per cent. of the blood of the foundation cows remains in the herd after the third generation. He can better afford to go wrong purchasing his entire herd of foundation cows than to go wrong in selecting his herd bull. A poor cow transmits her characteristics to only one individual each year, while the bull influences a large number. Poor production in a cow may be found out in a year, and often less, but low production in a bull cannot be detected until his daughters are in milk, and by that time he has transmitted undesirable characteristics to several crops of calves.—*Seasonable Hints*, issued by the Canadian Department of Agriculture.

WEEDS AND THEIR ERADICATION.

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

(Continued from page 18.)

Ragwort. *Senecio Jacobœa*, L., Asteraceae.

This perennial plant is an introduction from Europe, where it is said to fancy light, chalky land. In Victoria, it thrives best on good strong soils, being especially vigorous on river flats.

Fig. 24.—Ragwort. *S. Jacobœa*, L.
Plant and Flower Stem.

Ragwort belongs to the same genus of plants as the common Grounsel, *S. vulgaris,* so much in favour with many small cage birds, and like that plant produces a great number of wind-borne seeds.

S. Jacobæa has a very distinctive appearance, which makes it easy to recognise, in spite of the fact that its leaves are subject to great variation in shape. In typical plants, the leaves are large, of a dark-green colour, and so irregularly cut that they give the plant its ragged appearance. (Fig. 24.)

This species varies greatly in height, ranging from 2 to 6 feet. The writer recently measured specimens that reached 6 ft. 2 in., but these were found growing among heavy bracken on the banks of the Upper Barwon River, near Forrest. From 2 to 4 feet, however, appears to be the average height of this plant. The flower heads are golden-yellow, about 1 inch in diameter, and are grouped in large, flat-topped clusters. They are probably at their best during January and February.

Ragwort has a fleshy tap-root, with a few thick root-stocks and fibrous roots attached. When green, it has often such a disagreeable odour that in some parts of England it goes by the name of "Stinking Willie." This plant is proclaimed under the Victorian Thistle Act for the whole of Victoria, and no opportunity should be missed to destroy so useless a weed, and one that is the cause of a fatal disease in cattle and horses.

In *A Manual of Weeds*, by Ada E. Georgia, America, the following reference to *S. Jacobæa* appears:—

> "When eaten by cattle it causes a fatal disease of the liver (*Hepatic cirrhosis*), locally known as Pictou Disease, which, for many years, was supposed to be contagious because of the fact that whole herds were often affected at the same time. But long investigation, and a series of careful experiments made under the direction of the Veterinary Director-General of the Dominion of Canada, have proved that this weed is the cause of the trouble. The Molteno Cattle Disease of South Africa is similar, and is due to the same cause. When green, the whole plant emits a most disagreeable fetid odour, and is disliked by grazing animals; but when dried in hay, it is freely eaten by all kinds of stock, and is then a serious danger. Plants that are harvested and cured just before coming into bloom are said to be at their most noxious stage."

In the control of this plant, there is a lot of evidence to show that the pasturing of sheep on Ragwort-infested areas will go a very long way towards the eradication of this weed. Sheep are very partial to the young plants, and can be utilized for feeding these off. They should not be kept too long at a time on infested land, but should be given a change to good grass, though, unless the infestation be very bad, there will usually be sufficient grass to counteract any bad effects the plant might have on the sheep.

Cultivation will easily suppress ragwort, but where this cannot be practised, the plants should be hand-pulled, and burnt before there is any opportunity for the seeds to ripen.

Bristly Ox Tongue. *Picris echiodes*, L., Asteraceae.

This coarse annual or biennial weed, Fig. 25, is a native of Europe, Asia, and Africa. It is becoming much too common in Victoria on cultivated lands, and on made up land, such as railway embankments, &c. Its seeds are wind-borne, which has enabled it to become very

widely spread. It is not poisonous. Its prickly, hairy foliage and yellow flowers have such a bitter taste that stock will not eat it. Cultivation should easily suppress this plant; and on land that cannot be cultivated no opportunity should be neglected of hoeing it out before its seed has any chance of ripening and being dispersed by the wind.

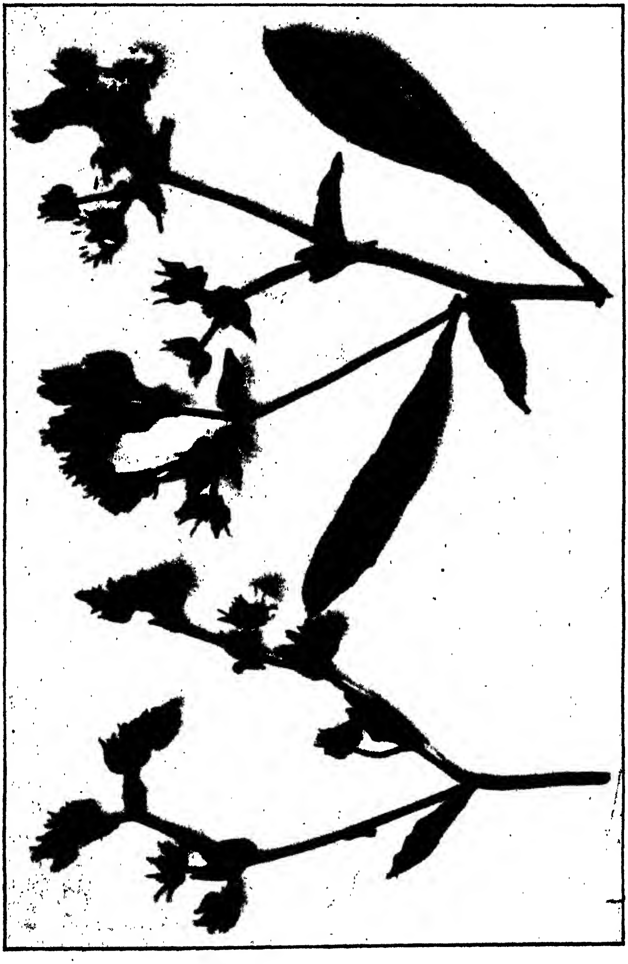


Fig. 25.—Bristly Ox Tongue. *Picris echiodes*, L.

Poison Hemlock. *Conium maculatum*, L., Umbelliferae.

Often growing to a height of 7 feet or more, this very poisonous plant has now a very wide range. It delights in moist situations, or in districts having a good rainfall. Hemlock has several names given to it, but probably it is best known as the "Carrot Fern." (Fig. 26.)

It is a very strong-growing, biennial species, and is a much-branched, graceful plant; its elegant leaves are divided into many segments, and this gives them a fern-like appearance. (Fig. 27.)

The strong, polished and light-coloured stem is purple-spotted. Its small white flowers are exceedingly numerous in terminal clusters, and

Fig. 26.—Stem of Carrot Fern. *Conium maculatum*, L.

make the plant a conspicuous object during the spring and early summer months.

It is said to have been a species of hemlock which furnished the "Cup of Death" drunk by the condemned philosopher Socrates in Ancient Athens; but the *Conium* of the Greeks is supposed by some

authorities to have been obtained from the roots of the Water Hemlock, *Cicuta virosa*, L., which is very poisonous.

All parts of the hemlock now naturalized in Victoria are poisonous, and stock have often suffered through eating the plant, and in some instances children have been poisoned in the same way.

Hemlock is usually found growing on the banks of creeks and river flats, also on road-sides in moist situations, as it is a moisture-loving species. When growing in the former situations, it is usually so strongly rooted as to render hand-pulling impossible, so that grubbing it out

Fig 27.—Carrot Fern Leaf.

becomes necessary. First-year plants and older ones growing on road-sides can usually be hand-pulled or hoed out without much difficulty. They should be gathered together soon after pulling, and piled on brushwood and burnt, so as to prevent a chance of any of the plants maturing seed.

Where a number of small plants are scattered about, they could be mown, and salt afterwards applied to the roots.

Poison Hemlock is proclaimed, under the Victorian Thistle Act, for the whole of Victoria.

(*To be continued.*)

STANDARD TEST COWS.

REPORT FOR QUARTER ENDED 31st DECEMBER, 1921.

During the quarter 99 cows completed the lactation term, 81 of the number qualifying for the certificate. Individual results are as follow :—

Owner.	No. completed.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Calving Date.	Days in Test.	Milk last Day.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
Mrs. F. M. Akehurst, East Caulfield	2	2	Jersey ..	Violet 9th of Rocklee	Not yet allotted	2.2.21	273	10½	3,103	5·71	177·23	175	202¼
				Canary 11th of Kingsvale	7181	9.2.21	273	15	4,128	6·19	255·48	200	291¼
C. Bamford, Benalla	4	4	Ayrshire ..	Rose of Medburn Grove..	Not yet allotted	16.2.21	273	12	4,426	4·44	196·39	175	224
				Beauty of Medburn Grove	4858	15.3.21	273	9	6,432	4·14	266·32	200	303¾
				Linda of Medburn Grove	Not yet allotted	19.3.21	273	24	6,860	4·14	283·82	175	323½
				Bloomer of Medburn Grove	,,	27·3·21	273	14½	5,273	3·96	208·83	175	238
Mrs. Irene Beard, Outtrim	2	Nil	Jersey ..										
J. Benallock, Elliminyt	1	1	Ayrshire ..	Blanche of Woodbyrne	3314	13.1.21	273	21½	6.520	3·88	253·08	250	288½
Mrs. Agnes Black, Noorat	1	1	Jersey ..	Noorat Maurguerite	6413	21.3.21	273	16½	8,328	4·66	387·95	250	442¼
Callery Brothers, Bannockburn	3	2	Ayrshire ..	Rose Royal of Langley Park	2841	4.1.21	273	16	7.654	4·25	325·30	250	370¾
				Roseleaf of Langley Park	4953	21.3.21	273	8½	5.799	4·94	286·33	200	326½

CERTIFICATED COWS—*continued.*

Owner.	No. completed.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Calving Date.	Days in Test.	Milk last Day.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
J. W. Cochrane, Moorabbin	1	Nil	Ayrshire ..										
W. C. Greaves, Monomeith	6	6	Ayrshire ..	Verbena of Warrook	Not yet allotted	8.1.21	240	4	6,638	4·26	283·14	250	322¾
				Fairy of Warrook	5170	19.1.21	229	4	5.685	4·95	281·41	250	320¾
				Verona of Warrook	5174	23.1.21	259	8	7,297	4·11	299·91	250	342
				Trixie of Warrook	Not yet allotted	24.1.21	226	4	4,507	4.43	199.63	175	217
				Vanity of Warrook	2546	27.1.21	273	23	8.508	4·63	393·86	250	449
				Fuchsia of Warrook	2544	8.2.21	223	24	7,061	4·08	288·07	250	328½
T. Harvey, Boisdale	1	1	Jersey ..	Bluebell 2nd of Jerseyholm	6845	15.3.21	273	17½	7,507	5·57	419·26	200	478
J. H. Hunter, Tyntynder Central	3	3	Jersey ..	Rarity 11th of Melrose	6944	1.2.21	273	17½	7,096	5·67	402·61	200	459
				Chevy 12th of Melrose	6941	20.2.21	273	24	7,431	6·14	455·98	200	519¾
				Peerless of Meadow Vale	Not yet allotted	13.3.21	273	12½	4,345	6·25	271·77	175	309¾
J. Hutchinson, Somerville	1	1	Jersey ..	Audrey's Victress of Somerville	Not yet allotted	15.1.21	273	16½	4.585	5·25	241·79	175	275½
A. Jackson, Glen Forbes	1	1	Jersey ..	Beauty's Daffodil of Lesterfield	Not yet allotted	22.1.11	273	14	4,255	4·89	208·10	200	237¼
S. A. Johnson, Woodend	1	1	Ayrshire ..	Bountiful of La Motte	5252	25.1.21	259	6½	6.895	4·54	312·88	250	356¾
A. W. Jones, Whittington, Geelong	5	4	Jersey ..	Butter Queen 2nd of Meryula	Not yet allotted	3.1.21	273	22½	5,531	5·28	292·05	175	333
				Wee Choice of Tarnpirr	7068	17.1.21	273	10	5,339	7·11	379·70	200	432¾
				Lady Grey 8th of St. Albans	4187	24.1.21	273	17½	8,710	4·70	409·13	250	466½
				Lady Grey 9th of St. Albans	6998	14.3.21	215	4	4,653	6·04	281·10	200	320½

Certificated Cows—*continued*.

Owner.	No. completed.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Calving Date.	Days in Test.	Milk last Day.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
A. W. Jones, Whittington, Geelong	4	2	Friesian ..	Melba	Not yet allotted	23.2.21	271	12½	8,579	3·95	339·00	250	386½
				Bolobek Bess	,,	23.3.21	273	6	8,814	4·04	356·34	250	406¼
Kerr Brothers, Bacchus Marsh	5	5	Shorthorn ..	Morven Daphne 10th	Not yet allotted	7.2.21	273	14½	7,604	3·59	273·04	250	311¼
				Morven Pansy 8th	,,	9.2.21	273	8½	7,605	3·62	275·65	250	314¼
				Morven Pansy 7th	,,	28.2.21	273	27	8,923	4·04	360·12	250	410½
				Morven Oxford Summerton	,,	19.3.21	273	19	7,289	3·98	290·23	250	330¾
				Morven Lizzie 10th	,,	23.3.21	273	17	7,107	3·54	251·41	250	286½
R. Kerr, Boisdale ..	1	1	Friesian ..	Bolabek Bella	327	26.3.21	269	31	12,366	3·39	418·91	200	477½
G. Keys, Hallam ..	2	2	Ayrshire ..	Ivy 2nd of Wethersdane	4160	7.1.21	273	13½	6,999	3·81	266·99	250	304¼
				Iris of Wethersdane	6481	10.1.21	273	15	6,003	4·20	252·39	200	287¾
A. Kirby, Daylesford	1	1	Jersey ..	Pride of Wattle Bank	5315	19.1.21	273	18½	6,110	4·45	272·12	200	310¼
J. A. Lang, Warrion	3	2	Ayrshire ..	Pansy 3rd of Riccarton	6,510	21.1.21	273	21	5,850	3·75	229·49	175	261¾
				Esme 2nd of Riccarton	6501	17.3.21	273	8½	6,243	3·65	227·75	200	259¾
Mrs. E. M. Lennie, Tongala	1	1	Jersey ..	Primrose 2nd of Bonshaw	7102	28.1.21	273	17½	5,936	5·23	310·21	250	353¾
Leslie and Gerrand, Sale	1	Nil	Ayrshire ..										

Certificated Cows—*continued*.

Owner.	No. completed.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Calving Date.	Days in Test.	Milk last Day.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
C. D. Lloyd, Caulfield	1	1	.. ..	Werribee Northwood Madeira 6th ..	6540	3.2.21	273	22½	6,753	6·09	411·57	250	469¼
C. G. Lyon and R. R. Kerr, Heidelberg	7	7	Jersey ..	Mabel's Petal of Banyule	7122	20.1.21	273	20½	6,367	5·46	347·42	200	396
				Silvermine 20th of Banyule	7131	27.1.21	273	18	6,443	5·90	380·17	200	433½
				Woodruff Lady Monda	Not yet allotted	30.1.21	273	19	5,960	5·06	301·64	200	343¾
				Molly 7th of Banyule	,,	19.2.21	273	20	7,241	4·65	336·40	175	383½
				Silvermine 21st of Banyule	,,	27.2.21	273	15	5,038	5·65	284·55	175	324¼
				Mascotte of Banyule	,,	2.3.21	273	11	4,443	5·48	243·45	175	277½
				Mezzo of Banyule	,,	11.3.21	273	11	4,861	5·19	252·37	175	287¾
C. W. W. Macauley, Rochester	1	1	Jersey ..	Honey of Wanalta	7164	15.3.21	273	17	5,428	4·95	268·74	175	306¼
L. McFarlane, Bundoora	3	3	Ayrshire ..	Lassie of Ayrbrae	6641	28.12.20	273	12½	5,797	4·18	242·08	175	276
				Heather Bell of Ayrbrae	Not yet allotted	17.1.21	271	12	6,492	4·32	281·45	175	321
				Heather of Winslade	,,	9.2.21	273	11½	5,217	4·83	251·91	200	287¼
W. Meredith, Ondit	1	1	Ayrshire ..	Lilian of Willow Vale	4650	2.3.21	273	17	7,180	4·14	297·60	250	339¼
T. Mesley, Dalyston	2	2	Jersey ..	Gazelle 2nd of Warenda	6141	23.1.21	273	33	9,601	5·35	513·67	250	585½
				Tilly Lantry 2nd of Warenda	7198	6.3.21	171	19	4,300	6·08	261·53	200	366¼
Mrs. L. Orchard, Grahamvale	1	1	Jersey ..	Myrtle 2nd of Jersey Vale	7222	1.1.21	273	9½	3,657	5·55	202·96	200	231½
Miss Bruce Reid, Bundoora	4	2	Jersey ..	Jubilee Violet	Not yet allotted	7.1.21	273	7	3,513	5·72	200·98	200	229¼
				Retford Fawn	3056	3.3.21	273	7	5,215	5·32	278·45	250	317½

Certificated Cows—*continued.*

Owner.	No. completed.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Calving Date.	Days in Test.	Milk last Day.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
J. Rogers, Yarraville	1	1	Ayrshire ..	Prunny of Golden Vein	2653	30.1.21	273	22	7,774	3·62	281·05	250	320½
G. Rowe, Kardella ..	2	2	Jersey ..	Rose of Welbourne	7398	10.1.21	273	9½	5,730	4·39	251·40	250	286½
				Pattie of Hillcrest	Not yet allotted	30.1.21	273	13½	4,192	4·93	206·70	175	235¾
F. Sadler, Camperdown	3	2	Shorthorn ..	Rosetta 3rd	Not yet allotted	16.1.21	273	18½	7,582	4·15	314·97	250	359
				Pet of Hillcrest	..	18.1.21	273	15½	5,016	4·66	233·44	175	266
Sadler Brothers, Noorat	5	4	Ayrshire ..	Greta of Burnbrae	6488	17.12.20	273	22	6.608	3·73	246·16	200	280¾
				Butterfly of Burnbrae	5835	12.2.21	273	20	6,218	3·95	245·91	175	280¼
				Ruby of Burnbrae	3085	3.3.21	273	19½	6,755	3·78	253·97	250	289½
				Brilliant 2nd of Kilmarnock	5850	21.3.21	273	26½	6,353	4·60	282·31	175	321¾
A. H. S. Schier, Kernot	6	1	Ayrshire ..	Marguerite of Glengowrie	4632	23.2.21	273	20	6,193	4·53	280·37	250	319¾
J. Scott, Chiltern ..	2	2	Jersey ..	Maitland's Petal	3338	9.1.21	273	24	6,319	5·44	343·44	250	391½
				Captor's Thora	3329	22.2.21	273	31	8,583	6·06	520·42	250	593¼
Mrs. E. Sims, Toolern Vale	1	1	Jersey ..	Royal Sun Ray	Not yet allotted	23.1.21	273	19	6,828	4·97	339·17	250	386¾
O. J. Syme, Macedon	2	2	Friesian ..	Princess Ena	299	6.3.21	273	28½	10,619	3·50	371·09	250	423
				Domino Hengerveld Belle	307	22.3.21	273	29	11,448	3·63	415·09	250	473¼

CERTIFICATED COWS—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Calving Date.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
H. L. Webb, Sunbury	1	1	Ayrshire ..	Lily of Holly Green	4772	7.2.21	273	19½	8,327	4·69	390·61	200	445¼
W. Woodmason, Oakleigh	6	6	Jersey ..	Jenny Lind 9th of Melrose	5543	22.12.20	273	19½	6,986	5·97	417·27	250	475¾
				Graceful Duchess 11th of Melrose ..	4518	30.12.20	273	23½	6,728	6·17	415·07	250	473¼
				Graceful Duchess 19th of Melrose ..	7540	16.1.21	273	26½	6,296	6·42	403·98	200	460½
				Edith 6th of Melrose	7539	5.2.20	273	20	6,278	6·08	381·39	250	434¾
				Pearl 2nd of Melrose	3670	8.3.21	273	12	5,973	5·40	322·44	250	367½
				Waverley Lass 3rd of Melrose	6312	27.3.21	273	16½	6,082	6·45	302·21	250	447

WORLD'S POULTRY CONGRESS.

A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

The report of the first World's Poultry Congress, held at the Hague from 5th to 9th September, 1921, has now been received in Australia. The Congress originated with the International Association of Poultry Instructors, and had the official recognition of the Netherlands Government, with the patronage of H.M. the Queen of the Netherlands.

Some 400 delegates, including 130 from the United Kingdom, participated in the proceedings; New Zealand was represented by a gentleman who went at his own expense, and Australia was represented by an official from the High Commissioner's Office.

The papers submitted represented a summary of the knowledge of the civilized world (other than Australasia) in various phases of the poultry industry, and indicated a universal awakening as to the nutritive value of poultry and eggs, the economic importance and possibilities of the industry—not widely visualized—and the invaluable assistance that has been rendered to the industry by breeders of pure strains, and by scientists working towards combating disease.

It is earnestly to be hoped that at the next Poultry Congress, to be held in America in 1924, Australia will be amply represented and in a position to make clear some of the important factors in fecundity which may have been overlooked at the first Conference.

The first section of the Congress dealt with experiments, investigation, science of breeding, and its practical application.

The second section dealt with State and other official action, including reconstruction.

The third section dealt with hygiene and diseases.

The fourth section dealt with the training and necessary qualification of poultry instructors, education, and demonstrating work.

Egg Production of White Leghorns and White Wyandottes.

In the first section Major C. C. Hurst, in a lengthy paper, dealt with "The Genetics of Egg Production in White Leghorns and White Wyandottes, and its application to Poultry-breeding." Reference is made to Dr. Raymond Pearl's experiments, one of the features of which was the proof of the extreme value of the son of a heavy laying hen. Major Hurst concluded that, as a result of various experiments, early sexual maturity was a dominant factor, late sexual maturity being recessive. As regards winter production, fast laying was dominant, and slow laying recessive, which also applied to spring production. On the other hand, he considered that slow, or discontinuous autumn production was dominant to fast, or continuous, autumn production.

Broodiness was found to be dominant over non-broodiness (recessive).

Size of eggs, as represented by pullets in their first laying year, were graded into nine different grades, grade 1 being eggs $1\frac{1}{2}$ ozs. to under $1\frac{5}{8}$ ozs., each grade rising an eighth of an ounce in weight up to the ninth grade, which was for eggs $2\frac{1}{2}$ ozs. and over. It was considered customary for a pullet to lay from five to seven different grades each year, the small egg being dominant, and the large egg recessive.

Egg Colour.—Brown eggs were considered dominant to white shelled eggs (recessive). The deepest colour was usually found in Rhode Island Reds, Cochins, and Langshans, classed as grade 5, whilst grade 4 represented the ordinary brown egg, grade 3 a light brown egg which might be termed the mode egg of White Wyandottes and Light Sussex, grade 2 a cream tinted white egg, the mode egg of Old English Game, and at times produced by White Wyandottes, Light Sussex, and White Leghorns. Grade I., an ivory tinted white, the mode egg of the White Leghorn, and Grade O, a pure chalky white, produced only by White Leghorns.

It was found that egg colour was much less variable in the individual hen than egg size. The individual Leghorn usually laid one or two grades only in the year.

Breeding for Egg Production.

The winter egg production was considered by far the most important. For high winter production two genetic factors were considered, *E* (early maturity) and *W* (fast laying); *e* (late maturity) and *w* (slow rate factors) are obviously not wanted, and any factors containing them must be discarded. Thus, to secure high winter layers, Early-Slow (Ew) and Late-Fast (eW) should be eliminated, and only Early-Fast (EW) retained; but Major Hurst discovered *four* kinds of Early-Fast (EW) birds, and not all will breed alike. They are Double-Early Double-Fast (EEWW), Single-Early Double-Fast (EeWW), Double-Early Single-Fast (EEWw), and Single-Early Single-Fast (EeWw). Of these, only EEWW is of any use for a permanent strain. Birds of this breed are not only high producers, but will breed high producers. The problem is to discover the EEWW pullets. As both factors were dominant, Major Hurst tested by mating with the double recessive eeww male, late maturer, slow layer. Where any late (ee) or slow (ww) birds came from this mating, the mother had to be discarded, but if all the daughters were early and fast, the mother was classed as EEWW. In these experiments a Cumberland strain of O.E. Game Cockerels, a strain noted for poor laying qualities, was used.

The objection in Australia to the foregoing method would be two-fold—first and foremost, the loss of a breeding season whilst experimenting with game cocks, and, secondly, the trouble of getting rid of the mongrel progeny.

Broodiness might be avoided by breeding only from non-broody hens.

Size of eggs presented greater difficulties because it was found that the "small" egg was dominant, consequently Cockerels should be only bred from habitually large-egg-hens for several generations.

The principal difficulty from which all British experimentalists seem to suffer is the extremely low record type of hen from which they appear to breed, the birds used averaging 195 eggs in their pullet year.

Australian experiments would therefore be of much greater value where large quantities of birds (260 to 280 test) can readily be obtained. The poorness of the British hens is emphasized in Major Hurst's interesting paper by the concluding paragraph:—"These experimental birds were reared under inferior conditions, and there is no doubt that

under *optimum* conditions *high* records would have been produced, probably averaging 225 instead of 195. Their dam's record was 215, and their sire's dam's record was 216." No Australian commercial egg farmer could keep going if he depended on 216 egg cockerels!

A paper, by Mr. J. Hammond, of School of Agriculture, Cambridge, dealt with recent research in animal production, covering ground with which the average up-to-date poultry farmer is more or less familiar, such as the inheritance of high production, the American pigmentation theory, variability in accordance with the season of the year and temperature as regards egg production, the time of year the pullets are hatched, broodiness, effect of exercise, duration of fertility after removal of male bird, &c.

Food Value of Eggs.

One of the best advertisements the egg, as an article of human diet, ever received, must have been the highly instructive paper by Professor Dryden, of the Oregon Agricultural College. As in my own opinion it cannot be too widely circulated, it is accordingly given verbatim:—
"The future prosperity of the poultry industry is dependent very largely upon an increased consumption of eggs and poultry. The consumption may be increased in two ways: First, by improving the quality of the eggs that are put on the market. More eggs are naturally eaten when they are fresh. The consumption would be enormously increased if consumers could always depend upon securing good, fresh, wholesome eggs, and any agency that will promote this end should receive the encouragement of poultry-breeders everywhere. If, on the other hand, consumers had a better understanding of the real value of eggs, the consumption would be very much greater.

"It seems from recent scientific investigation that the egg has only one real competitor in the world among the essential foods for human beings, and that is milk. The lowly cow and the humble hen carry the burden of the world, so far as it relates to the physical well-being of races. The use of eggs has saved the Chinese from extinction, and milk and eggs have been the factor in making the civilizations of Europe and America superior to that of the Orient, in the opinion of Dr. E. V. McCollum, who divides mankind into two groups on the basis of character of diet. On the one hand, the Chinese, Japanese, and the peoples of the tropics generally, and in the other class the peoples of Europe and America. The diet of the former has always been one of seeds, roots, tubers, meats (principally fish), and leafy vegetables. The Chinese eat more or less eggs, but there are no dairy products in China. On the other hand, Europeans and Americans are liberal eaters of both milk and eggs. According to Dr. McCollum, the result has been that the Chinaman is small, his span of life is short, infant mortality high, and they have never contributed anything new in invention or science or political system.

"In contrast are the peoples of Europe and America in normal times. They are the largest people in the world, have the lowest death-rate, the longest span of life, the lowest infant mortality, and they are the people who have become the great masters over the forces of nature, and have accomplished most in every line of activity. Dr. McCollum believes the difference is a matter of diet—physiological rather than racial.

"The difference in diet is that we have made use of all types of foodstuffs used by the peoples of the Orient; in addition, very liberal quantities of milk, and have used liberal quantities of eggs. Negroes and poor white people live on products from wheat flour, corn meal, rice, rolled oats, potatoes, or sweet potatoes, and meats. That diet undermines the constitution of these people, so that they become a prey to tuberculosis. Tuberculosis is not due primarily to faulty diet, but it is only contracted if the powers of resistance are sufficiently low.

"To show the effect of an egg diet in the prevention and cure of certain diseases, the work of Dr. Goldberger, of the Washington Health Service, is pointed out. He has studied pellagra, and arrived at the conclusion that this disease was due to faulty diet. He has cleared insane hospitals and orphan asylums absolutely free of this disease by liberal quantities of milk and eggs.

"Probably the most noteworthy result of these researches is that chemical analysis has failed to give us a correct understanding of the nutritive needs of animals, as well as human beings. The value of a food has been judged largely, if not wholly, by its protein content, and often by its heat units as determined by chemical analysis. From the newer nutrition it seems that chemical feed formulas have had their day. We know from actual feeding experiments that vegetable protein is not the same as animal protein, and did not produce the same result in egg yields. This fact, of tremendous importance to the human race, was given to the world as a result of observations and experiments with live-stock and poultry. Dr. McCollum proved that young animals would not grow when fed on wheat alone. The experiment was tried on rats and farm pigs. Scores of later experiments showed that a mixture of various seeds—corn, wheat, oats, peas, barley, rye—did not produce growth. Adding vegetable oil, almond oil, peanut oil, cottonseed oil did not make growth. But when butter fat or egg yolk fat were added, normal growth was obtained.

"Young rats, fed on purified proteins, carbohydrates, fats, and mineral salts did not live longer than when allowed to fast. Growth was secured when the fat in the food mixture was butter fat, and egg yolk fats were tried, and found to produce growth in the same manner as butter fat. The substance in butter fat responsible for this growth is as yet an undefined chemical substance, but has been called fat-soluble A. The purified egg yolk fats and butter fat would, however, only produce growth when fed in a ration containing another unknown substance, which has been called the water-soluble B. This substance is found in various seed plants, especially the leaf plants, and is also found in egg yolk and butter fat. When the fat has been removed, and then a water extract is made of the remaining egg yolk, the second substance, termed water-soluble B, is obtained.

"Both these substances are only found abundantly in eggs and milk.

"Human beings have been under the delusion that they were well fed because their diet contained a sufficient amount of protein, with proper heat value. Food values have hitherto been based on heat units or calories to the disadvantage of eggs. The newer knowledge of the science of nutrition has given the egg an importance in diet that

was never known before. With the backing of scientific research, the poultry interests may now organize a movement in the interest of the general welfare, as well as of the poultry industry, to make known to the world the real value of their product. It is safe to say that no food product receives less advertising than the egg. Newspapers, magazines, tram cars, and hoardings are all used to increase the popularity and sales of various food products. Huge sums are spent in advertising a brand of chewing gum or chocolates, soaps, tooth paste, a raisin, or a prune, but never a dollar to advertise the best and most nutritious food—with the possible exception of milk—ever given to man.

"Moreover, the egg is sometimes discounted by advertisers of other food products, and some of it is misleading. A baking powder company recently distributed pamphlets throughout the United States, gave 55 recipes for doing without eggs without a loss of food value, the substitute being their own baking powder.

"Poultry organizations might well take account of such advertising, not only for the sake of the industry, but in the interest of the public, which should be made to understand that there is no real substitute for eggs, and that such advertising is a blow at the health of the people."

Mendelism—the Industry and the Fancy.

Professor R. C. Punnett dealt with the above, stating that with regard to Father Mendel's original experiments with the culinary pea "his aims were purely scientific and impractical," the objective being not to improve the pea, but merely to know how certain characters behaved on cross-fertilization, whereas Dr. Pearl had arrived at definite practical results, viz., that the male is the important sex in transmitting the quality of high fecundity in the hen. Mendelism is really a name for the organized knowledge of the facts of breeding, and the practical application of the Mendelian laws for poultry farmers is to secure the greatest number of eggs at the least cost. Professor Punnett then referred to the vexed "cockerel" question in the following words:—"I gather that one of the troubles of those who rear pullets for egg production is that half of the chicks will insist upon being cockerels, and cockerels are rather a source of loss than otherwise, especially the cockerels of most of the best laying breeds. A large breeder once said that if he could wring the necks of all his cockerels on hatching he could see his way to profitable business. In no breed is it possible to tell with absolute certainty the sex of the chick at the time of hatching, while in some of the heavier breeds it may be many weeks before the sexes can be told apart. But why rear all the cockerels? There is no necessity whatever to do so, provided that the breeder takes advantage of recent Mendelian work. The sex-linked mode of transmission, already alluded to in connexion with the inheritance of fecundity, has been shown to hold good for certain characters which appear in the newly-hatched chick. A silver hen mated with a gold cock transmits the factor for silver to her sons, but not to her daughters. A barred hen mated with a black cock transmits the barred character to her sons, but not to her daughters, who are black. These colour distinctions are a sure guide to the sex of the chicken. They enable the breeder to refer the newly-hatched chick to its proper sex with absolute certainty."

Practical Australian poultry farmers will be amazed that such an extraordinary argument in favour of breeding mongrels could ever have been put forward seriously before a gathering of world's experts in poultry keeping. All the benefits of strain as regards egg production are swept aside in a few words to make way for mongrels!

These theories, however, put forward by Professor Punnett, fortunately can be very quickly disproved, as his claims are not absolutely correct in fact.

Some years ago, on a noted black Orpington farm in Victoria, a few pure-bred barred Plymouth Rock pullets were mated with a noted laying strain, Black Orpington male bird. Nearly all the resulting pullets were barred, some being so well barred, and with yellow legs, that they were sent to a laying competition (not Burnley) as pure-bred Rocks, passed muster as such, and averaged over 200 eggs each. Yet according to the professor, all the pullets must be black. One wonders why? That such a complete denial of Professor Punnett's work can be put forward is, to some extent, very unfortunate. It opens up an avenue of doubt with regard to other experiments that may be made. An experiment once or twice made on colour breeding does not by any means make uniform results a "natural law." Many years of work *on a large scale* are necessary before any dogmatic statement can be laid down.

Experimental work must also bear a direct relationship to the praccal economics of the industry. Having evolved a laying strain of high fecundity, correct colour of shell, and proper size of egg, it would be the height of folly to throw all this away merely to be able, by cross-breeding, to try to determine the sex at hatching, instead of a few weeks later. How can the strain be carried on?

The man who can get a dozen or so first-class stud males reared each season is usually satisfied, even if the surplus and reject cockerels do not show much margin of profit.

(*To be continued.*)

THE BREEDING COCKERELS.

Many poultry-keepers, after selecting the most promising cockerels for future breeding purposes, place them in small coops or confined quarters. This is a mistake, as such conditions do not tend towards promoting vigorous and healthy growth. Confinement is necessary in fattening cockerels, but it is most undesirable in the case of those it is intended to breed from, it having the effect of over-forcing the birds, a common cause of leg-weakness and other troubles, such as falling combs, &c. In the building-up or maintenance of a heavy-laying strain the question of stamina in the male is of supreme importance. I therefore cannot suggest a better way of promoting this than by giving the growing bird a good range under the most natural conditions possible. Of course, this should go hand-in-hand with good breeding, housing, and general efficient management.—F. C. BROWN, in *New Zealand Journal of Agriculture*, January, 1922.

SPRAYING EXPERIMENTS FOR BROWN ROT OF STONE FRUIT (SCLEROTINIA FRUCTIGENA).

Report by A. A. Hammond, Orchard Supervisor.

During last season, experiments were carried out at Messrs. Burgi Brothers' orchard at Seville to determine the best and cheapest spray for the control of Brown Rot, and also to ascertain the results of spraying at different times, and the advantages of three or four sprayings as compared with one or two. Much attention was given to the effect of the different spraying mixtures on the foliage and fruit, which is of particular importance, and valuable information was obtained,

The fungicides used were as under:—

(1) Bordeaux mixture 12–8–80, pre-blooming, and 3–9–50 and 3–3–50 and 3–3–40, for late sprayings.
(2) Woburn Bordeaux, that is, 13¾ gallons clear lime water, 1 lb. bluestone, made up to 80 gallons with fresh water.
(3) Acetate of copper, 1 lb. to 13 gallons water pre-blooming spray, and 10 ozs. to 40 gallons, and 15 ozs. to 40 gallons for late sprays.
(4) Lime sulphur, home made (boiled), 26 Baumé specific gravity 1.220, used 1 in 9, pre-blooming spray.
(5) Self-boiled lime sulphur 15–15–80, late spray.
(6) Sulphur sprays, including atomic sulphur (imported), atomised sulphur (Leggo's), and home-made sulphur wash, the latter being prepared with casein, skimmed milk and flour paste respectively.

One and a half gallons of lime sulphur 26 Baumé was added to the home-made sulphur and skimmed milk wash for cherries, and 1 gallon added to the same mixture for late spraying for peaches. Ten pounds of dry sulphur was used to 80 gallons in the home-made sulphur washes. An average of 2¾ gallons of mixture per tree was used. The trees were large, and it required this quantity of mixture to give them a thorough spraying.

The experiments were carried out on plum, peach, and cherry trees. In the plum block there were seventeen trees all of the Yellow Magnum Bonum variety except one, a young Grand Duke. The peach trees, forty in number, were Zerbe's No. 1, except for two Smith's Seedlings. The cherries were a mixed lot of twenty-five, comprising Burgdorf's Seedling, Twyford Biggareau, Napoleon Biggareau, White Heart, St. Marguerite, Florence, and Doncaster Seedling. In the numbers given check trees have not been included. All the trees treated were labelled and numbered, and particulars of treatment were recorded on the labels.

Check trees were left in each of the three plots. As one of each variety of cherry tree could not be set aside, it was decided to leave for check purposes three Burgdorf's Seedlings, a variety that was badly attacked by Brown Rot last season. This season, however, it was very free from the disease.

In addition to the spraying done on the experimental plots, different kinds and varieties of trees were treated in other parts of the orchard and notes taken of the results.

The plum and peach yields were very light; the cherries set a fair crop. Magnum Bonum plums and an early variety of peaches were chosen because these were badly affected in the previous season. Cherries were treated in order that experiments might be made with one of the fruits most susceptible to the Brown Rot.

It is doubtful whether the leaving of check trees in juxtaposition to sprayed ones is advisable when testing methods for suppression of such diseases as the Brown Rot Fungus. On the one hand diseased trees would infect clean trees growing near by, and on the other the effect of spraying sulphur washes in the vicinity, and clean culture would tend to keep the unsprayed trees cleaner. I may mention here that isolated peach, cherry, and plum trees which had not been treated were rather badly diseased, whereas check trees in juxtaposition to treated trees were not appreciably more diseased than those treated.

The whole of the orchard received several thorough sprayings during the present season (1921-22), with the exception of a few check and isolated trees already mentioned, consequently the disease was not nearly so bad as in the 1920-21 season. Most orchardists did some spraying this season as a protection against Brown Rot, whereas last season little or none was done. In a few neglected orchards the crop of cherries was practically destroyed, and the fungus was equally as bad as in the 1920-21 season.

Cultivation is not usually carried out by Messrs. Burgi Brothers until after the early spraying is completed, but this season at my suggestion the ploughing was done much earlier than usual, and was completed in most of the orchard before the trees were in full bloom. It is probable that this early ploughing helped to make the orchard generally much cleaner than it was during the previous season.

Sprayings were given to the experimental plots on the undermentioned dates:—

31 August (when all the trees, check trees included, received a pre-blooming spray).

12th, 18th, 26th, and 27th October.

9th and 29th November.

14th December.

The motor pump was used except in the case of a few trees which were sprayed with a hand pump.

The work of checking the infected fruit was done as accurately as possible in the circumstances. I was present when the cherries were picked, and slight infection could be detected on only a very careful examination. Mr. E. Burgi assisted me in checking the cherries, and as shown in the tables there was very little difference between the results of different sprays and the check trees in juxtaposition. As mentioned previously, there was a marked difference between treated trees and isolated trees where no spraying or cultivation had been done.

In the experiments with peaches and plums the work of checking infected fruits was comparatively easy. It will be noticed in Table 2 that no percentage of infected peaches is given. The reason for this omission is that during my absence about Christmas time the infected

fruit in the orchard was collected and destroyed. Owing to a mistake the peaches in the experimental plot were also collected. From my own observation and from inquiries made, I believe that there was no appreciable difference in the results of different sprays used and the number of applications given.

Messrs. Burgi Brothers were very reluctant to leave any trees unsprayed in the orchard. I can quite understand their anxiety concerning the check trees, as they suffered considerable loss from Brown Rot in the season 1920-21.

Sulphur sprays were given a fair test. These sprays are largely used in America to combat this disease. Atomic sulphur (American), atomised sulphur (Australian), and home-made sulphur wash were used side by side. No difference in the efficacy of the different sulphur sprays could be observed.

The home-made sulphur wash was prepared as follows:—Ten pounds of fine ground sulphur was run through a sieve for the purpose of breaking up small lumps, &c. This sulphur was wetted by slowly adding hot water and mixing thoroughly while at the consistency of stiff paste or bran-mash. (If made too thin the whole of the sulphur will not be properly wetted.) Casein solution was then added as a sticker and spreader. Casein solution is made by boiling 2½ gallons of water to which has previously been added 3 ozs. of Greenbank's caustic soda. When at the boil 20 ozs. of casein powder is sprinkled in, and the mixture is simmered for ten minutes. When cool it is bottled in 10-quart bottles. One quart of the solution is used to 80 gallons of sulphur spray. The efficacy of sulphur sprays for this disease has yet to be demonstrated. They do not adhere as well as lime sulphur or self-boiled lime sulphur. This applies particularly to smooth-skinned fruit such as cherries and plums. In the case of peaches and apricots, which have a hairy skin, it is different. An advantage of the sulphur sprays is that they are clean and safe, and may be used late in the season without fear of damaging the fruit in any way, while lime sulphur cannot be sprayed within five weeks of harvesting, otherwise the fruit, peaches particularly, will not become clean by the time they are ripening.

None of the spray mixtures did any injury to fruit or foliage excepting Bordeaux mixture on the peach trees. These trees were sprayed with Bordeaux at a strength of 3–3–50, 3–9–50, and 5–5–75. In all cases they got a set back, and stopped growing, and the fruit was discoloured on one side. However, they recovered, and did not cast their fruit. I have sprayed peaches in mid-December with the 3.9.50 Bordeaux without doing the slightest injury, and I attribute the injury done on the occasion under notice to following the Bordeaux spray with tobacco wash for Aphis about eight days later.

I have come to the conclusion from what I have observed this season that either Bordeaux or lime-sulphur (boiled) may be used for the first spray for all kinds of stone fruits except apricots. For later spraying I think the sulphur sprays should be used for peaches and apricots, and Bordeaux for cherries and plums. Smooth fruit, such as the latter, will not hold the sulphur, whereas the peaches and apricots will do so. With cherries, the first spraying should be given when, say, 10 per cent. of blossoms are open. Cherries are very susceptible when in bloom to infection by the Brown Rot fungus. From what I observed this

season I am convinced that the time when the first spraying was applied, viz., 31st August, was too early for cherries.

I think also that in the case of cherries the second spraying should be applied immediately after fruit sets. In regard to peaches and plums, the fungus, so far as I have observed, does not attack these fruits at the blossoming stage, or, if so, not to any appreciable extent.

All kinds of fruit seem to be very liable to infection at about ripening time, and sprayings should be given as late as possible consistent with uncontaminated and clean fruit at harvesting.

The right time to apply sprays is dependent on the weather. If there is a prospect of rain the spraying should be delayed as long as possible. It is better to spray trees when in full bloom than spray on the early side and run the risk of having the mixture washed off before the fungus appears.

As already mentioned, the Burgdorf's Seedling was badly affected in 1920-21 season, and comparatively free from disease in the season just past. The weather conditions at blooming and ripening periods would appear to be the cause of this. During the blooming period, 18th to 25th September, in 1920, the rainfall was for the eight days 232 points. In 1921 the rainfall for a similar period was 146 points. During the ripening period in 1920, viz., 9th to 16th November, the rainfall was 242 points, and for a similar period in 1921, 136 points. The mean temperature for eight days during blooming period in 1920 and 1921 respectively was 60.5 for the former and 62.7 for the latter; and the temperature for the periods when fruit of this variety is ripening was 72.3 in 1920, as compared with 77.3 in 1921. It will thus be seen the weather was drier and warmer in 1921, when this variety was in the most susceptible condition for infection—that is, during the time it is in bloom and when the fruit is ripening. A study of the rainfall and temperature at blooming and ripening times of all varieties show that the Brown Rot fungus is more dependent on weather conditions for development than is the case with any other orchard disease.

It will be noticed in the figures given below that the rainfall for the periods, 1st September to 15th January, in 1920-21 and 1921-22 seasons respectively, was heavier in the season when fungus was at its worst. The mean temperature, however, was practically the same for the periods under notice:—

RAINFALL AND TEMPERATURE FOR SEASONS 1920-21 AND 1921-22, 1ST SEPTEMBER TO 15TH JANUARY.

—	1920-21.		—	1921-22.	
	Rainfall.	Mean Temp.		Rainfall.	Mean Temp.
	points.			points.	
Sept. ..	735	62.5	Sept. ..	388	65.3
Oct. ..	649	67.8	Oct. ..	550	66.2
Nov. ..	326	70.7	Nov. ..	361	73.0
Dec. ..	117	79.0	Dec. ..	171	74.0
Jan. (15 days)	285	78.9	Jan. (15 days)	305	78.7
	2,112	mean 71.7		1.775	mean 71.4

I am of opinion that the Brown Rot fungus will be most difficult to control by spraying in a wet season owing to the rapidity with which it fructifies and spreads. If, however, it is attacked in a season unfavorable to its development it could be eradicated. The lesson that growers have been taught during the past two seasons should cause them to make a special effort to cope with this disease when the conditions are unfavorable for it—that is, in normal and dry seasons when only a very small percentage of the fruit is affected. If the odd peach or plum seen a few years ago were destroyed as advised by officers of this branch the loss of thousands of pounds would have been avoided.

If experiments are continued next season I will make arrangements to secure a plot at Croydon. To obtain reliable data the experiments should extend over three seasons at least. From experience gained this season I advise the following treatment:—

(1) Remove all mummied fruit and with it infected wood when pruning, and, if practicable, burn same.
(2) Plough before infection time and turn in all diseased leaves, twigs, &c.
(3) Spray cherries with 12.8.80 Bordeaux when 10 per cent. of blooms have expanded, but later or earlier according to weather.
(4) Spray cherries again with 4.4.40 Bordeaux when fruit has set, and again with Woburn Bordeaux 14 days before ripening.
(5) Treat plums same as recommended for cherries.
(6) Spray peaches while at the pink stage with a full strength mixture of lime sulphur or Bordeaux.
(7) When husks are cast spray again with self-boiled lime sulphur, and again with sulphur spray thirty days before harvesting.

As to cost of the different spraying mixtures used, the home-made sulphur washes were the cheapest and the acetate of copper the dearest.

Excluding labour and fuel, the approximate cost of 80 gallons of the undermentioned sprays was as follows:—

	£	s.	d.
Home-made lime sulphur wash—26 Baumé ..	0	3	6
Self-boiled lime sulphur—15–15–80 formula ..	0	3	0
Sulphur wash and casein (home made)	0	1	10
Atomic sulphur (10 lbs. wetted sulphur used) ..	0	8	4
Atomised sulphur (10 lbs. wetted sulphur used) ..	0	8	4
Bordeaux mixture (full strength)—12–8–80 ..	0	6	0
Bordeaux mixture (half strength)—3–3–40 ..	0	3	0
Woburn Bordeaux	0	0	6
Acetate of copper—dormant spray	1	7	0
Acetate of copper—summer spray	0	9	0

It will be noticed in the table giving percentages of infected fruit that the acetate of copper was the least effective. Its cost, moreover, would make its use prohibitive. The lime sulphur used was made in accordance with the Department's formula, viz.:—Sulphur, 20 lbs.; fresh lime, 10 lbs.; water, 13 gallons. When boiled for 1 hour the stock

mixture is reduced to about 10 gallons. When tested with the hydrometer the solution was found to be 1.220 Spec. Gravity.

The quantity of water in gallons to add for dormant spraying is found by dividing the decimal portion of the Spec. Grav. by .028. For summer spraying the decimal portion is divided by .008.

For example, .220÷.028=8 nearly, and .220÷.008=27½, which represents the number of gallons of water for winter and summer spraying respectively to be added to stock mixture. In the experiments under notice the lime sulphur was not used after fruit set, except when added to the sulphur washes.

TABLE 1.

Plum Block-var-Magnum Bonum.

Tree Nos.	——	Remarks.	Percentage of infected fruits.
1	Bord., 12-8-80, 31st Aug.	Light crop ..	4
2	,, ,, ,, sulph. casein, 10 to 80, 11th Oct.	Very light ..	..
3	Lime sulph., 1-9, 31st Aug. ,, ,, ..	Very light ..	..
4	,, ...	Light ..	..
5	Acet. of copper, 1 lb. to 13 gals., 31st Aug. ..	Light ..	..
6	Bord., 12-8-80, 31st Aug.	Medium ..	10
7	,, ,, ,, ...	Medium ..	4
8	Lime sulph., 1 in 9, 31st Aug. ; sulph. casein, 10 lbs. to 80 gals., 11th Oct.	Light ..	1½
9	Acet. copper, 1 lb. in 13 gals., 31st Aug. ..	Light ..	3
10	Bord., 12-8-80, 31st Aug.	Medium ..	7
11	,, ,, ,, Bord., 3-3-40, 14th Dec.	Medium ..	..
12	Lime sulph., 1 in 9, 31st Aug. ,, ,, ..	Medium ..	2
13	,, ,, ,, ...	Very small tree	..
14	Acet. copper, 1 lb. in 13 gals., 31st Aug. ..	Light crop ..	2
15	Sulph. casein, 10 lbs in 80 gals., 11th Oct. ..	Light ,, ..	1
16 and 17	Check trees, 5 per cent. infected		

TABLE 2.

Peach Block-var-Zerbe's, No. 1.

Sprays used and Time of Spraying.

Tree Nos.

1. Bord., 12-8-80, 31st Aug.
2. ,, ...
3. ,, .. ,,
4. ,, ...
5. ,, ...
6. ,, ... Bord., 3-3-50, 12th Oct.
7. ,, ,, ,, ,, 3-9-50, ,,
8. Bord., 12-8-80, 31st Aug. : atomic sulph., 10 lbs. to 80 gals., 29th Nov.
9. ,, ,, ,, ,, ,, ... ,,
10. ,, ,, ...
11. ,, .. ,, ,, ,, ,, ...
12. ,, ,, ,, Bord., 3-3-50, 18th Oct. : atomic sulph, 10 lbs. to 80 gals., 29th Nov.
13. ,, ,, .. Bord., 3-3-50 18th Oct ; atomic sulph., 10 lbs. to 80 gals., 29th Nov.
14. ,, ,, ,, Bord., 3-3-50, 12th Oct. : atomic sulph., 10 lbs. to 80 gals., 29th Nov.

TABLE 2—*continued.*

PEACH BLOCK—*continued.*

15. Lime sulph., 1 in 9, 31st Aug. ; self-boiled lime sulph., 27th Oct. ; atomic sulph., 10 lbs. to 80 gals., 29th Nov.
16. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
17. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
18. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
19. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
20. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
21. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
22. Lime sulph, 1 in 9, 31st Aug. ; self-boiled lime sulph., 27th Oct. ; home-made sulphur wash plus 1 gal. lime sulph. 26 Baume, 29th Nov.
23. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
24. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
25. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
26. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
27. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
28. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
29. Acet. of copper, 1 lb. to 13 gals., 31st Aug ; home-made sulphur wash plus 1 gal. lime sulph. 26 Baume, 29th Nov.
30. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
31. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
32. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
33. Acet. of copper, 1 lb. to 13 gals., 31st Aug. ; acet. of copper, 10 ozs. to 40 gals., 18th Oct. ; home-made sulphur wash plus 1 gal. lime sulph. 26 Baume, 29th Nov.
34. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
35. Acet. of copper, 1 lb. to 13 gals., 31st Aug. ; atomised sulphur, 10 lbs. to 80 gals., 29th Nov.
36. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
37. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
38. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
39. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,
40. ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,

The percentage of infected peaches cannot be given, as infected fruits were collected during Christmas holidays by Burgi Bros. The experimental plot infected fruit was collected in error.

TABLE 3.

Cherry Block.

Tree Nos.			Percentage Infected.
1.	B.	Sprayed, Bordeaux, 12–8–80, 31st Aug. ; Bord., 3–3–50, 12th Oct. ..	5
2.	Mar.	,, ,, ,, ,, ,, self-boiled L. S., 27th Oct. ; Woburn, 29th Nov. ..	1
3.	W.H.	,, lime sulph., 1 in 9, 31st Aug.	3
4.	Mar.	,, ,, ,, ,, ,, self-boiled, 15–15–80, 27th Oct. ; acet. copper, 29th Nov. ..	2
5.	Mar.	,, acet. of copper, 1 lb. to 13 gals., 31st Aug.	3
6.	Mar.	,, ,, ,, ,, ,, ,, ...	3
7.	Twy.	Unpruned. Bordeaux, 31st August ; Bord., 3–3–50, 12th Oct. ; Woburn, 9th Nov.	10
8.	T.	Pruned. ,, ,, ,, ,, ,, ,, ,,	8
9.	T.	Unpruned. Lime sulph, 31st Aug. ; atomic sulph., 10 lbs. to 80, 12th Oct.	20
10.	T.	Pruned. ,, ,, ,, ,, ,, ,, ,,	14
11.	N.B.	Lime sulph., 31st Aug. ; self-boiled, 26th Oct.	7
12.	B.	Acet, of copper, 31st Aug. ; acet. cop., 10 ozs. to 40, 12th Oct. ..	20
13.	T.	Acet. of copper, 31st Aug. ; acet. cop., 10 ozs. to 40, 12th Oct. ; 15 ozs. to 40, 27th Oct. ; 9th Nov.	18
14.	B.	Bordeaux, 31st Aug. ; Bord., 3–3–50, 12th Oct.	8
15.	B.	Lime sulph., 31st Aug. ; home-made sulph. and casein, 10 lbs. to 80, 12th Oct.	8
16.	B.	,, ,, ,, home-made as above, 12th Oct. and 27th Oct. ..	8

TABLE 3—*continued.*

CHERRY BLOCK—*continued.*

17.	B.	Bordeaux, 31st Aug.	10
18.	B.	„ „	10
19.	D.S.	„ „	10
20.	D.S.	„ „	10
21.	F.	Sprayed, Burgi Bros., three times; once lime sulph., and twice self-boiled, 15, 15 lbs. to 80 gals., last spray sulph. milk, 29th Nov.	10
22.	F.	Did not receive last spray	10
23.	Mar.	Sprayed as 21, and received sulph. milk spray, 29th Nov.	2
24.	M.	Did not receive last spray	8
25.	M.	Check tree not sprayed during season	18
		Burgdorp's (3) check trees	10 per cent.

The Bordeaux used pre-blossoming spray was in all cases 12–8–80 formula. The lime sulphur used was home-made 26 Baume. The self-boiled was 15–15–80 formula, and was prepared with *cold water.*

Abbreviations.

B., Bedford Prolific; F., Florence; T., Twyford; N.B., Napoleon Biggaram; D.S., Doncaster Seedling; Mar., Marguerite; Burg., Burgdorp's Seedling; W.H., Whit Heart.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

GREEN MANURES.

If a cover crop of leguminous plants is required for green manuring a start at planting may now be made. This can be done only when all the fruit has been gathered from the trees. An early crop is a distinct advantage. The cover crop should make a good growth before the winter sets in, as the plants make very little headway in the cold weather, and they require to be ploughed in as soon as the ground is dry enough in early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will adequately cover the surface before winter.

CULTIVATION.

Should the weather remain hot and dry it will be very necessary to give the land surface a good stirring, so as to conserve water supplies. Where fruit crops have been gathered a start may be made late in the month with the autumn ploughing; whatever ploughing is done should be left as rough as possible.

PESTS.

No codlin moth-affected or diseased fruit of any kind should be left on the ground after the crop has been gathered. These should all be destroyed by boiling.

All rust-affected foliage and fruit of plum and peach trees, as well as all other stone fruits that have been attacked by this and other fungus diseases, such as shot-hole, &c., should be burned if possible. This will minimize the possibility of future attacks.

The Vegetable Garden.

Autumn weeds must be kept out of the kitchen garden. These rapidly grow, and remain as robbers right through until the spring time.

The section should be well dug over for planting winter crops. Before digging a light sprinkling of bonedust and a good top dressing of stable manure should be spread on the surface. These may then be dug in, as they provide humus for the soil. Large plots should be avoided in winter; where such occur a path should be run down the centre. This will provide more efficient drainage. The beds, too, may be more raised than in the summer time.

Early onions may be planted out in the beds, and, if not already done, onion seed should be planted at once.

All classes of seedlings may be planted out, and seeds of lettuce, early peas, beet, carrots, radish, cabbage, cauliflower, and swede turnip may be sown.

Asparagus beds should be cleaned up and cut down as soon as the berries begin to colour. Celery rows should be kept earthed up; rhubarb beds should be given a dressing of manure to encourage the coming winter crop, and new rhubarb plantations may now be established.

The Flower Garden.

All classes of spring-flowering bulbs may now be planted. In bulb planting the bulbs should not come in contact with any manure. The manure should, some time previously, have been dug well in, and mixed with the soil, and all heat should have disappeared. If manure is required it should be placed below the bulb, so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils, and where the soil is heavy a little sand may be added to advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the size of the bulb. Such bulbs as freesias may be covered with only an inch of soil, while larger bulbs may be somewhat deeper.

The increasing prevalence of both bulb mite and rhizoctinia fungus in attacking bulbs makes it a matter of urgency that all bulb gardens and plots should be well dressed with lime before the bulbs are planted. The lime should be dug into the soil; and after the bulbs have been planted, a top-dressing should also be given. Each dressing need not exceed 2 ozs. per square yard. Clifts's manurial insecticide is also good.

Dahlias and chrysanthemums may be fed with liquid manure, or mulched with stable or poultry manure. In any case the feeding should not be too strong nor too frequent, and it should always be withheld before the flowers come.

All hardy annual, biennial, and perennial seeds may now be planted. Among these are dianthus, candytuft, sweet peas, Iceland poppies, anemone, ranunculus, stock, wallflower, columbine, foxglove, phlox, penstemon, pansy, gaillardia, &c.

Wherever aphis and red spider occur the plants should be sprayed with benzole emulsion, nicotine, pestend, or soaperine, or some other preventive in order to protect the coming flowers. Mildew attacks on the rose should be warded off by the use of sulphur. The sulphur may be either dusted on the plant or it may be scattered on the ground around and under the plant.

March is one of the best months for transplanting evergreen plants of all classes, trees, shrubs, and palms. The roots of the transplanted plants should be disturbed as little as possible, while the roots of those transplanted from pots should be well uncoiled and set out before planting.

The soil is now warm, and the roots will quickly take hold and grow. They are thus established for the winter, and will give little or no trouble in the subsequent summer heat and dryness.

In preparing the soil for planting the trees care should be taken not to dig small holes. A small hole is simply a "pot hole," in which the winter water accumulates, and as a result the young tree roots are rotted.

A large hole should be dug; or better still, the whole planting area should be well cultivated all over, and the plants or trees then set out in this cultivated area.

REMINDERS FOR APRIL.

LIVE STOCK.

HORSES.—Those stabled should be fed liberally. Food of a more stimulating nature can now be given to get them well over the "changing coat" season. Those doing fast or heavy work should be clipped; if not wholly, then trace high. The legs should not be clipped. Those not rugged on coming into the stable at night sweating freely should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Yearling colts if vigorous and well grown may be castrated. Weaned foals should have a little crushed oats daily, if available. Horses to be turned out during winter should not be clipped. Their mouths and feet should be examined and attended to where necessary.

CATTLE.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. It will be found profitable to give a few pounds of bran, crushed oats or pollymeal in addition to other feed, to all cows giving a fair quantity of milk. Read article by Mr. B. A Barr, "Food Values and Rations," in *Journal* for September, 1916. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Irrigated lucerne may be scarified in autumn, Algerian oats sown, and in this way good feed provided for cows in winter. Only exceptional cows or those required for city milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter, give the best returns for the season, and be dry when the feed is dry and at its worst. Calves should have lucerne hay or crushed oats when grass is not plentiful. Take care that salt lick previously recommended is available. One or two pounds of linseed cake or meal given daily should be found beneficial. In addition to its feed value, the oil in the cake or meal will counteract the effect of dry feed, which is liable to cause impaction.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs

should be highly profitable now, as pork is very dear. Rape, barley (especially skinless), oats, &c., may be sown for grazing during winter. Crushed oats will be the most economical feed for pigs at present prices.

SHEEP.—Merino and fine cross ewes, if mated early, will lamb from now on. Those in lamb to the larger British breeds of rams can be expected to give a certain amount of trouble in lambing.

Close attention should be given morning and evening to save every lamb possible, and pick up any ewes that may be cast. If the ewes are well-woolled sorts, they will need crutching, at the same time clear wool from around teats, and from the eyes. If the ewes are attentive mothers, any lambs that are found dead after these precautions, apart from weather conditions, foxes, &c., are just as well gone. Give purgative drenches at first sight of ewes appearing ill in any way. Give warm salad oil to any lambs that are dull in appearance. Ewes after difficult parturition or retention of after-birth can often be saved by flushing out with ½ oz. Lysol to 3 pints warm water. Reserve fresh pasture, or better still, sow a mixed green crop to turn ewes into later on, but not while carrying the lambs, this is too often injurious. On fine mornings when attending ewes, if feed is plentiful and ewes strong castrate as many ram lambs as possible, they are easily caught when two or three days old. Place them between the feet on the ground, no holder is necessary. In districts where conditions make second dipping a necessity, see that it is done before the weather becomes too unsettled.

POULTRY.—Do not feed maize this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Add to drinking water one packet of Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit, shell, and charcoal should always be available.

CULTIVATION.

FARM.—Dig potatoes as they mature. Cart out and spread stable manure. Finish preparation of land for main cereal crops. Sow Chou Moellier seed in beds for transplanting. Sow the following mixture per acre for green feed during the winter months for the dairy herd:—1½ bushels, Oats; ½ bushel, Cape Barley; ½ bushel, Tick Beans; ½ bushel, Pease. Sow Giant Drumhead Cabbage for transplanting (1 lb. sufficient for 1 acre, in rows 3 feet apart); provided the soil is in good friable condition, plants from seed sown last month should be planted out. Sow wheat and oats according to locality; also rape for winter feed or green manuring. Prepare clean seed-bed for lucerne; and sow Hunter River, Arabian, or Peruvian seed, free from dodder, in drills 7 inches apart and at the rate of 12-16 lbs. of seed per acre. Sow permanent pastures with grasses and clovers.

VINEYARD.—Examine "Yema" grafts to see if strings require cutting. Consideration must be given to manuring; early application is strongly urged. Peas, &c., for green manuring should be sown as soon as possible.

Cellars.—Cleanliness is emphatically urged. Carefully remove all fermentable refuse—skins, lees, skimmings, &c. Such odds and ends favour multiplication of Vinegar Flies (*Drosophila funebris*). If present, destroy these with formalin or insecticide powders. A little bisulphite or sulphurous acid in washing water is recommended; also free use of lime on floors, &c.

ORCHARD.—Prepare land for planting; plough deeply and sub-soil. Plant legumes for green manure. Plant out strawberries. Clean up Codlin Moth from trees as soon as all fruit is gathered.

FLOWER GARDEN.—Plant out evergreen shrubs, trees, and Australian plants, divisions of herbaceous plants, seedlings, layers, and rooted cuttings. Feed chrysanthemums with liquid manure weekly until flowers begin to open. Prepare land for future plantings of roses and shrubs. Keep dahlias tied to stakes.

VEGETABLE GARDEN.—Plant out seedlings from the seed beds. Dig all vacant spaces roughly. Sow onions for early crop; also peas and broad beans. Clean out asparagus beds wherever the seeds are ripening.

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CROP AND FALLOW COMPETITION, RUPANYUP, 1921.

Report of the Judge, H. A. Mullett, B. Ag. Sc., Chief Field Officer.

The Crop and Fallow Competition organized by the Rupanyup Agricultural Society continues to rank as one of the most important held in the Wimmera. This year fifty-two entries were received in the three sections open for competition. In all twenty-five farms were visited. The area of wheat actually inspected totalled 5,460 acres—a record for any district. It averaged 210 acres per farm. The area of fallow judged was 1,100 acres.

The yield of each crop was carefully estimated, and a thorough examination made for disease and other peculiarities. Each competitor supplied full particulars of his method of growing the crop. By a comparison of the apparent yields and methods it has been possible to make deductions which throw some light on the best methods of growing wheat.

A feature of the competition is the Brunton Cup—a handsome silver trophy donated by Messrs. Brunton and Company, Flour Millers, for the best wheat crop raised on one farm over a period of three years. The whole of the wheat on the farm must be entered. This provision accounts for the comparatively large areas of wheat submitted for inspection on each competing farm at Rupanyup. It insures the crop being produced under conditions which are normal for the whole farm.

The season was a bumper one, and after making a critical inspection of the whole of the Wimmera, one is safe in asserting that, on the average, heavier crops were grown in no other district. Yields of 40 bushels to the acre were common enough, and a few were close on 50 bushels. If anything the crops were too rank, especially where sown in June. Some loss must have occurred in the "down" patches especially, as cut-worms found suitable cover as well as green straw there late in the season.

The soil at Rupanyup, in common with most of that on the southern boundary of the black land in the Wimmera, is exceedingly fertile. There are two main grades—heavy blue, grey, friable clay loams on the southern margin and brownish black loams further inland. There are red soils at Marnoo, and of course the usual red patches throughout the district as well.

The heaviest crops appeared to be those on the brownish black soils. On the whole these soils grow quite as good crops as the heavier type, and they are somewhat easier to cultivate.

In this district, as at Horsham, Murtoa, Minyip, and Dimboola, it is found that the land can be cropped heavily to cereal crops without a spell in grass, provided of course a bare fallow is interposed before

Comfortable Homestead—Mr. McLennan's, Marnoo.

the wheat. Under this system the land becomes easier to cultivate, is freed from weeds and, far from yields declining, they appear for the present to increase, save, of course, when an occasional oat crop is omitted from the rotation; then takeall and black rust often make their presence severely felt. There is, therefore, little land resting in grass to be seen at Rupanyup. Indeed, many farms are without sheep, except a few for household purposes. Thus at harvest time the extent of the area sown to wheat in the district is an impressive sight to the visitor. The effect is heightened by farmers occasionally sowing contiguous paddocks of wheat which may stretch several miles without a break. In all these fields the level character of the standing crops and the densely packed heads of wheat were indicative of heavy yields.

There is no question that on this class of soil the profit is in cultivation—not in stock raising—and that the profit has not been inconsiderable is evidenced by the comfortable homesteads seen everywhere. But while it is difficult to argue in face of the gradually increasing

yields secured under the present system of farming, yet the fact that slowly but inevitably the humus content of the soil is being reduced must not be lost sight of. It may take generations before the effect is felt, but it will come some day. In the meantime those who wish to preserve the fertility of their land undiminished would do well not to neglect the sheep. Where oats is sown specially for their grazing, it will be found that the system pays quite as well.

Lessons from the Competition.

In assessing the yields of the magnificent crops at Rupanyup, and in questioning farmers on their methods, it gradually becomes evident that very definite reasons exist for the heavy crops, and causes equally definite for any light ones. As a rule the notably heavy crops raised there this year possess certain features in common. Most of them were grown on summer-fallowed land, which had been specially thoroughly cultivated, and which had been liberally seeded and manured.

Residence of Mr. C. Carra, Rupanyup, surrounded by young orchard.

That, of course, is always the story everywhere in the Wimmera, only this instance at Rupanyup illustrates it perhaps rather more clearly than usual.

If the data obtained in the field is examined statistically and the six crops yielding heaviest are compared with a similar number yielding poorest, it is found that four of the best are on summer-fallowed land, and five of the worst are on winter fallow. Again, the six best crops were cultivated on an average of 9.6 times, whilst the six worst were cultivated only six times.

With the six best crops an average of 82 lbs. of seed and 122 lbs. per acre of superphosphate was used; while with the six worst 69 lbs. of seed only was used, with 98 lbs. of manure per acre. The figures for the latter, too, are inflated by the fact that in several instances an attempt was made to bolster up poor cultivation by extra supplies of seed and manure.

If there is another thing that stands out, it is the comparative excellence of most of the seed wheat grown. Compared with that exhibited several years ago, there is a marked improvement. Last

season the society arranged for the purchase in bulk of some 360 bags of graded seed wheat from the Longerenong College. The wheat was purchased in one lot and railed by the truck load.

Results.

SECTION 2.—FOR BEST 60 ACRES OF WHEAT.

Twenty entries were inspected in this section. In most cases they comprised the best portions of the crop submitted in the Brunton Cup. Naturally in a season like the present, and in a district so well favoured in soils, they were exceedingly heavy. The yields in some cases must surely constitute a record.

The entry of Mr. A. Dunlop, Lallat, was placed first with 99 points. The variety was Federation—as was that of practically every other competitor. In all 190 acres of wheat were seen on this farm, and it was difficult to pick out one 60 acres as better than another. The crop was exceptionally true to type, free from weeds and from any

Residence of Mr. W. H. Kendell, Rupanyup.

disease. The wheat presented a level table-top appearance, and the heads were well filled. The generally attractive appearance of this crop was enhanced by straight work with the binder in opening the tracks.

The fallow on which the crop was grown was treated as follows:—It was summer-fallowed with a scarifier, and then in the winter ploughed with a skim plough. In the spring two strokes with the scarifier were given. After harvest the paddock was harrowed, and then towards the end of June it was re-scarified, drilled, and harrowed. Seventy pounds of seed per acre were used, with 90 lbs. superphosphate.

The excellent result secured is undoubtedly due to nice judgment displayed in the treatment of the fallow, and in seeding the crop when the conditions were at their best. The soil was of the brown, black, friable loam type.

Sixty acres of Federation shown by Mr. R. J. Jackson, Burrero, were awarded second place. In all respects this was equal to the first crop, except that the yield appeared somewhat lighter. The seed was pure, the crop clean underfoot, and disease was absent. A special

feature was absence of excess straw. Fine straw and smallish heads, pendular when ripe, appear to be characteristic of this particular strain of Federation. It was quite free from foreign heads.

This crop was also grown on summer-fallowed land which, it may be stated, was of a rather lighter type than that of Mr. Dunlop. In March the paddock was spring-toothed and then harrowed twice. In July it was scarified and harrowed twice. In October another scarifying was given, followed by the harrows. After harvest time a further stroke of the harrows was given, and the final scarifying took place in May. Then there was a double harrowing before the drill, which was followed by the harrows. The paddock was drilled late in June, 80 lbs. of seed with 102 lbs. superphosphate being used.

It will be noticed that thirteen strokes of the cultivating implements of one sort or another were given this field.

Well-preserved Fodder Reserves—Mr. C. Carra's.
(Note mouse-proof enclosures.)

Mr. Jackson is following his present system with great success. His crop last year averaged some 43 bushels per acre for 265 acres.

The crops of Messrs. W. Newall and D. N. McLennan were bracketed equal with 96 points. They were both heavier than the last crop, but lost a few points on the score of trueness to type, though in this respect they were far about the average. Both these crops were rather too tall for safety and ease in harvesting.

Mr. Newall's crop was grown on a fine black paddock, thoroughly summer-fallowed and liberally seeded and manured. In all no less than seven separate scarifyings and seven harrowings were given. Seventy-five pounds of Federation wheat was sown per acre at the end of July, with 186 lbs. of superphosphate.

Mr. McLennan's crop was grown on winter-fallowed land, well-worked and liberally seeded and manured. The land was ploughed in July, harrowed in August, and scarified at the end of August. Two

light strokes of the scarifier were given in September and October, the last followed by harrows. In March the paddock began to drift with the wind, and was harrowed to check this. In May and June it was worked up twice with the scarifier to kill weeds, and sown in July with 95 lbs. of seed per acre and 112 lbs. superphosphate.

The crop shown by Mr. C. Carra was also heavy, but lost points because it was "down" badly in patches. Full points were scored for the type of seed grown; it was quite free of strangers. The land was well-worked summer fallow. It was sown early in July, 80 lbs. of seed being used per acre with 120-130 lbs. of superphosphate.

Other good crops were shown by Messrs. R. Miller, W. Hemphill, G. Hemphill, D. Payne, Geo. Kennedy, and Bell Brothers.

DETAILS—SECTION 2—BEST 60 ACRES OF WHEAT.

Name.	Yield.	Trueness to type.	Disease.	Weeds.	Evenness.	Total.
Possible Points	**35**	**20**	**15**	**15**	**15**	**100**
A. Dunlop	35	19	15	15	15	99
R. J. Jackson	33	20	15	15	15	98
W. Newall	33	18	15	15	15	96
D. McLennan	35	18	15	14	14	96
C. Carra	34	20	15	14	12	95
W. J. Hemphill	30	19	15	15	15	94
G. Hemphill	29	19	15	15	15	93
D. Payne	30	19	14	13	14	90
Geo. Kennedy	31	18	15	12	14	90
Bell Bros.	29	18	15	14	13	89
G. Miller	29	19	13	12	14	87
H. Holcamp	25	19	14	13	14	85
C. Culton	27	16	15	12	15	85
J. J. Crampton	31	16	10	13	14	84
J. Sweetman	29	17	10	13	15	84
J. Chapman	24	19	15	12	14	84
W. H. Kendell	22	14	14	11	14	75
R. Duncan	20	18	12	10	14	74
R. Hurley	25	15	7	13	11	71

NOTE.—The points given for yield do not represent bushels per acre. The highest yields were well over 45 bushels per acre. The differences between the points, as near as it is possible to estimate, represent bushels per acre.

Section I.—Brunton Cup.

FOR BEST WHEAT CROP GROWN ON ONE FARM OVER A PERIOD OF THREE YEARS. THE WHOLE OF THE WHEAT TO BE SHOWN.

This is the second year of the competition; twenty-three farms are taking part. Mr. R. J. Jackson so far has gained the highest aggregate for the two years (185). Mr. A. Dunlop is second with 179, and Mr. W. J. Hemphill third with 178 points. The competition next year should be keen.

Mr. A. Dunlop secured the highest award this year. The description already given of his crop in the 60-acre section applies to the whole 190 acres. Ninety-eight points out of 100 were scored. Mr. R. Jackson was second with 88 points, Mr. W. J. Hemphill and Messrs. Carra Brothers were bracketed equal with 87 points each, as were Messrs. C. Carra and Geo. Kennedy with 86 points each. Mr. R. Jackson

showed 300 acres of Federation wheat, yet despite the large area the crop was wonderfully even and prolific throughout. The treatment of the 150 acres, summer fallowed, has already been described. The balance, winter fallow, was treated thus:—Skim-ploughed in August, harrowed twice; scarified in spring and harrowed. After harvest the paddock was harrowed and then scarified twice in front of the drill, drilled and harrowed. This paddock was sown last; it was finished on 15th July. One and a half bushels of Federation were used per acre, with 115 lbs. of manure. The manure was thus increased as the season advanced. A head or two of smut was noticed, and points deducted accordingly.

Mr. W. J. Hemphill's crop at Burrero consisted of 215 acres of summer fallow. Between nine and ten separate cultivations were given. The seed, Federation, was sown at the end of June at the rate of 80 lbs. per acre, with 112 lbs. superphosphate.

Messrs. Carra Brothers' crop of 100 acres of Federation was all sown on well-worked winter fallow. Seeding took place in mid-June. Eighty pounds of seed and 120 to 130 lbs. of superphosphate per acre were applied. The combined drill was used. This crop was very free from foreign heads and in every way creditable.

DETAILS.—SECTION I.—BRUNTON CUP.

For best wheat crop grown on one farm over a period of three years. The whole crop to be shown.

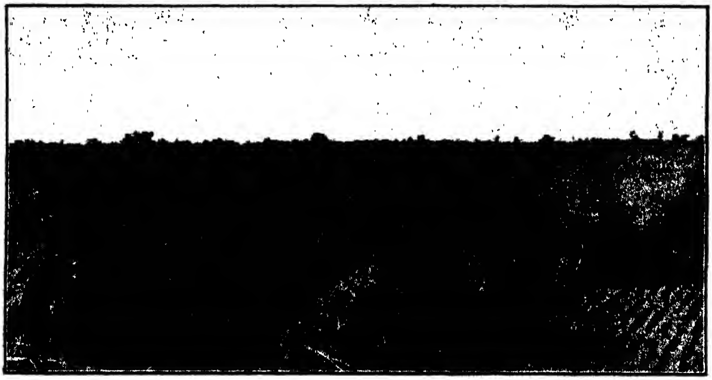
Name.	Area shown.	Yield.	Type.	Disease.	Weeds.	Even-ness.	Total, 1921.	Handi-cap.	Total, 1920.	Grand Total.
Possible Points ..	..	**35**	**20**	**15**	**15**	**15**	**100**	..	**100**	**200**
	Acres.									
A. Dunlop ..	190	34	19	15	15	15	98	..	81	179
R. J. Jackson ..	300	28	20	10	15	15	88	..	97	185
W. J. Hemphill	215	25	18	15	14	15	87	..	91	178
Carra Bros. ..	100	29	19	14	12	13	87	..	86	173
Bell Bros. ..	395	26	18	15	12	13	84	..	86	170
C. Carra ..	250	28	20	15	11	12	86	..	82	168
Geo. Kennedy ..	200	28	18	15	12	13	86	..	70	156
G. Hemphill ..	104	22	19	15	13	14	83	..	90	173
Miller Bros. ..	122	25	19	15	11	13	83	..	71	154
H. Holkamp ..	300	22	19	13	14	10	78	3	82	163
A. McKinnon ..	28	28	19	11	11	12	81	..	81	162
J. Chapman ..	137	21	19	15	12	13	80	..	79	159
J. J. Crampton	435	27	17	10	11	14	79	..	81	160
G. Ellard ..	265	27	19	10	11	12	79	..	81	160
C. Culton ..	200	27	16	10	11	14	78	..	74	152
W. H. Kendell	100	21	16	14	12	11	74	3	77	154
D. Payne ..	255	27	16	8	12	13	76	..	76	152
J. Sweetman ..	303	24	16	9	12	13	74	..	62	136
Geo. Chapman	285	20	17	13	10	13	73	..	87	160
C. A. Graham ..	270	24	14	10	12	12	72	..	75	147
R. Hurley ..	280	25	15	7	13	11	71	..	81	152
R. Duncan ..	220	18	18	13	8	13	70	..	75	145
A. Schafer ..	..	20	17	13	5	13	68	..	57	125

NOTE.—See note under Section 2.

Section III.—Best Fallowed Land.

Fifty Per Cent. of Fallow to be Judged.

Ten entries were inspected, all on black soil; nine had been summer-fallowed, and one was winter fallow. The first prize was awarded to the winter fallow of Mr. W. Newall. This paddock of 115 acres



Heavy Crop of Federation—Mr. R. J. Jackson's, Burrero, Rupanyup.

Mr. Newall's Fine Paddock of Federation Wheat at Marnoo.

appeared in perfect condition. The moisture conserved was high, the mulch deep and mellow, weeds were absent, and the cultivation had been thorough. Mr. Newall firmly believes in plenty of cultivation,

not only with the object of killing weeds, but also to till the soil so as to release plant food and to store moisture. He ploughs to 3½ inches deep, and subsequently when scarifying is not afraid to tear into the soil.

The paddock in question was ploughed with a set plough in winter, followed by the harrows. Later on the fallow was scarified three times, each time with the harrows following shortly afterwards. The result was a perfect piece of work. Ninety-nine points were awarded.

Mr. C. Carra was second with 97 points. One hundred and fifty acres of summer fallow was shown, consisting of a rich drained swamp with a few red patches on rising ground. The moisture content was good. The mulch was about 3 inches deep and of mellow texture. This paddock was ploughed in March, and then scarified in July, October, and early in November. Mr. Carra rarely uses harrows, as his land when worked down fine tends to blow.

Harvesting Oats with Reaper Thresher—Mr. D. Payne's, Rupanyup.

Mr. R. J. Jackson and C. H. Graham were placed equal with 96 points. Mr. Jackson's fallow is interesting in that 100 acres of it were prepared without the aid of a plough, after the manner practised in the Warracknabeal district. Unlike Mr. Carra, Mr. Jackson relies largely on the harrows to maintain tilth and conserve moisture. The paddock was scarified three times and harrowed five times. It may be remarked that this land is rather shallower and somewhat lighter in texture than that of Mr. Carra. There is no doubt that Mr. Jackson's practice suits his particular type of soil.

A number of the fallows were faulted because the bottom of the seed bed showed ridging, due either to careless driving or to the use of scarifiers with some of the points very blunt.

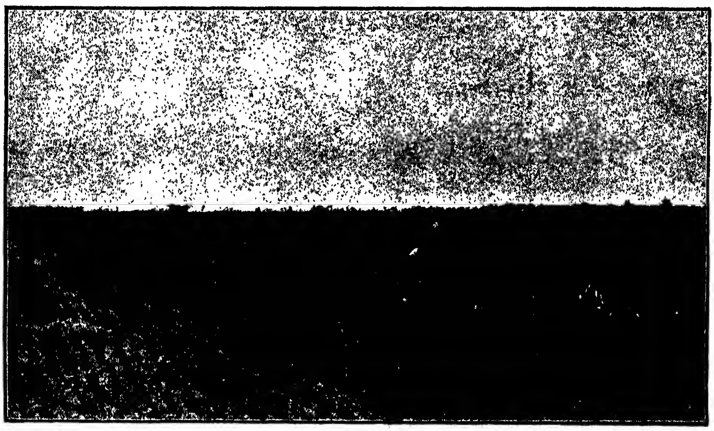
Fifty acres of the fallow shown by Mr. W. H. Kendell were ploughed with a set plough drawn by an oil tractor. The spring-toothed portion of a combined drill was used to work over the land with good effect

DETAILS.—SECTION III.—FOR BEST FALLOWED LAND. FIFTY PER CENT. OF FALLOW TO BE JUDGED.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible points	25	25	25	25	100
W. Newall	25	25	25	24	99
C. Carra	25	24	24	24	97
R. J. Jackson	23	24	25	24	96
C. H. Graham	25	22	25	24	96
W. H. Kendell	25	23	24	23	95
W. J. Hemphill	25	22	25	23	95
R. Miller	25	24	24	21	94
A. Dunlop	22	22	25	24	93
J. Sweetman	25	21	24	22	92
C. Culton	22	21	25	22	90
G. Miller	24	25	21	20	90

Layered Crop.

Probably never before have such rank crops of Federation wheat been seen in the Wimmera. Layered patches were observed in most heavy crops. Little trouble is experienced in dealing with these, now



A Tall Crop of Federation—Mr. W. J. Hemphill's.

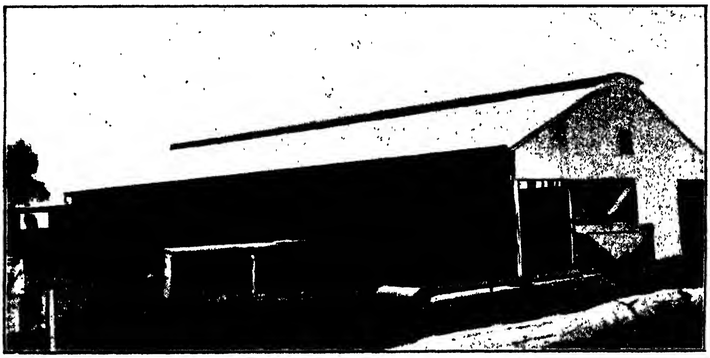
the reaper threshers have been installed, but there is always loss when wheat goes down. The grain is generally light, but this year the cut-worms ate many of the heads off as well. Rank crops can be avoided by late sowing or by feeding-off. This year, of course, many farmers have been without sheep, so that feeding-off was out of the question. Messrs. Miller Brothers, however, fed the whole of their crop off to sheep, with profit to the sheep and the crop this year. Sheep were on one 80-acre paddock as late as the end of September, yet the yield

was heavy. This indicates the vigor of the wheat plant in a season like that just passed. As a rule, a quick nip in July or August is all that may be safely permitted.

But late sowing is also a valuable and safe method of keeping crops on this class of land down to a reasonable height. As a rule here, there should be no need to commence seeding until July—the practice found most profitable at Horsham. Crops sown on this country at the end of May and early in June are bound to be rank unless "sheeped."

Mr. Newall cites an August sown crop last year, which yielded fifteen bags to the acre.

The later the sowing the heavier should the rate of seeding be, and the heavier the dressing of manure. Mr. Newall used 186 lbs. superphosphate to the acre with the above crop.



An effective stable—Mr. C. Carra's, Rupanyup.

Fallowing Methods.

There is apparently no one system of creating and maintaining the fallow which is applicable to the whole of the black soils in the Wimmera. The shallower portions in the northern section must be stirred less deeply than those, say, at Horsham and Murtoa, or on the Lallat plain, Rupanyup. On the shallower types the harrows occupy an important place among the cultivation implements. For the heavier soils, with their more vigorous weed growth, the scarifiers must be more largely relied upon, though judicious use of the harrows is also necessary. Whereas a mulch some 2½ inches deep is all that is desirable on the shallower soils, 3 to 3½ inches is not out of place elsewhere.

Sheep and Consolidation.

Sheep are very useful in compacting the under layers of Wimmera soils, which are naturally friable and cake with difficulty. Many

successful wheat-growers, among whom are Messrs. Smith Brothers, of Horsham, make it a practice to thoroughly tramp the fallows with sheep, quite apart from "sheeping" the crop hard back and deriving further consolidation then.

Where the fallow is tramped, it must be remembered that scarifying deeper than usual is necessary when fallowing. The sheep on the fallow cause part of the dust mulch to gradually adhere to the seed bed. The net result is that the mulch is often left too thin and the soil may crack badly.

Sowing New Land without Fallow.

It sometimes happens in the Wimmera that those farming new land cannot afford to wait eighteen months for their frst wheat crop. This wait would be necessary if bare fallowing were practised. It is generally recognised that the sweetening effect of a bare fallow is essential to success on new land, but that this is not always the case has been proved by a returned soldier who selected part of Warrenooke Estate and sowed wheat without fallowing, and with complete success. The crop was, however, not so heavy as some, but nevertheless it provided a quick return, which was the object required. It is probable, however, that the good season was a large factor in the success of this crop.

Tenant Farmers.

Recently land has been rented at Horsham up to as high as 23s. an acre. Rents of this sort have tempted many farmers to let their farms and return to the city. But the system of agriculture which it involves has its drawbacks. The tenant system in America has been found to stand for soil exhaustion, weed extension, and dilapidated improvements. Because of the high rents the tenant farmer is forced to look upon the soil as a sort of mine to be prospected and ultimately cast aside when exhausted. He looks also upon the farm only as a temporary home, and consequently buildings and fences fall into disrepair. The evil will be remedied when the owners realize that under the present system their land will steadily depreciate in value. What they gain in immediate rent they may lose in the long run in depreciation.

Contracts with tenants should clearly specify the rotation system to be followed, the amount of manure to be applied, and should provide for repair of implements. But these concessions cannot be exacted without reductions in the present rents. The rates at Rupanyup are so far on a much lower scale than those at Horsham, and consequently the tenants are able to pursue a better system of agriculture.

In conclusion, I desire to thank the secretary, Mr. J. W. Chapman, for his courteous assistance during the judging campaign.

DIMBOOLA CROP AND FALLOW COMPETITION.

Report of the Judge, I. M. Tulloh, Field Officer.

The town of Dimboola, situated as it is on the edge of the "Wimmera Plains," includes in its district, not only some of the heavy "Black Wimmera Soil," but also a large tract of Mallee, with its variations from heavy fringe country to the loose white desert sand. The local Agricultural and Pastoral Society, when arranging the schedule for the Annual "Crop and Fallow" Competition, has, therefore, to cater for a wide range of conditions. The competition this year was divided into eight sections—four for Mallee, and four for land, "other than Mallee"; the entries in the latter class were mainly heavy, black soil. The competitors were again divided into large and small farms—"over" or "under" 640 acres.

The number of entries this season was well above the average, and seven more than last year.

The season was a favorable one, and the sound methods generally applied throughout the district enabled the growers to take full advantage of it.

The rainfall for the year to the end of November was 16 inches, of which approximately 9 inches fell during the growing period of the crop. Rust made its appearance in early November, but, except in one or two isolated cases, did not materially affect the yield.

SECTION 1.

BEST 150 ACRES OF GROWING CROP OF WHEAT, ON MALLEE LAND, FOR GROWERS FARMING 640 ACRES OF LAND OR OVER.

Name.	Yield.	Purity.	Freedom from—		Evenness.	Total.
			Disease.	Weeds.		
Maximum Points	**40**	**20**	**15**	**15**	**10**	**100**
E. Schaefer	30	16	13	11	8	78
C. A. Mibus	29	16	11	11	8	75
E. Elsom	27	14	10	11	8	70

Mr. Schaefer's winning crop consisted of 100 acres of Red Russian and 50 acres of Federation. The land had been ploughed during July and harrowed immediately. It was spring-toothed near the end of October, harrowed in February after 2 inches of rain, and spring-toothed in April. Part was sown with the scarifier working in front of the drill, and the remainder sown with the combine. Some of that "combined" was also scarified previously—100 lbs. of both seed and manure were sown per acre. All the crop was harrowed a day or so after sowing, which was commenced at the end of May and was continued till the third week of June. The crop of Federation was hardly as thick as that of Red Russian, which is a popular variety on the Mallee soils of the district, and in this instance had stooled well, and

had developed into a dense crop, well headed, with the bigger proportion of ears carrying 3 grains per spikelet. A number of weeds were present, chiefly confined to wet patches, which were also the cause of a certain amount of unevenness.

Mr. Mibus' crop of Federation and Huff's Imperial was grown on land which had been fallowed in June, harrowed a fortnight later, scarified in October, and again in April. It was again scarified in front of the drill, when 70 lbs. of both seed and manure were sown per acre. Sowing was done during early June, and was followed by the harrows. This was a nicely-grown crop; points being lost mainly owing to the presence of ball smut and weeds, the latter chiefly wild oats.

Mr. Elsom had fallowed during September, ploughing to a depth of 3 to 3½ inches. The land was harrowed immediately after, but even then the sod had set into extremely hard lumps. It was scarified during October and November, and again in March. The crop was put in with the combine between the end of May to the middle of June, and harrowed and cross-harrowed within a few days of sowing; 93 lbs. of seed and up to 105 lbs. of super. were sown per acre. Smut was also present here, and there was some take-all, probably due to the later fallowing; otherwise it was a nicely-grown crop for this class of land.

Section 3.

Best Crop of 100 Acres Growing on Mallee Land, on a Farm Not Exceeding 640 Acres.

There were two entries in this section, those of Messrs. J. G. Glatz and G. C. Howland.

Name.	Yield.	Purity.	Freedom from—		Evenness.	Total.
			Disease.	Weeds.		
Maximum Points	**40**	**20**	**15**	**15**	**10**	**10)**
G. S. Howland	31	16	12	14	9	82
J. G. Glatz	27	18	11	13	8	77

Mr. Howland showed a fine crop of Federation, very even, and comparatively free from weeds. It was tall and nicely headed; there was, however, a fair number of foreign varieties and odd barley plants present.

Ploughing had been done in July, and the land harrowed immediately after. It was scarified in October, and again at the latter end of March, and early April. The crop was put in with the combine in early June, with the harrows following closely; 90 lbs. of seed and 94 lbs. of manure were sown per acre.

Mr. Glatz's main crop was Red Russian—other varieties grown being Dollar, Federation, and Major. The paddock of Red Russian had been ploughed in July, followed immediately with the harrows. It was scarified in October, again in March. With the scarifier working

in front of the drill it was sown at the end of June, with 90 lbs. of seed and 100 lbs. of manure per acre.

The land on which the other varieties were grown had been ploughed in early June and then harrowed. It had been scarified early in September, and again at the beginning of October, spring-toothed three weeks later, and harrowed during the first week of November. It was scarified in March, and again before sowing. It was drilled during the latter end of June, and harrowed a day or so behind the drill; sowing 100 lbs. of seed and 120 lbs. of manure per acre. The Red Russian was a nice even crop, but rather light compared to that of the winner, while smut was fairly prevalent. The other varieties, grown in another paddock, were dense and heavy in many places, but included light patches mainly on low-lying parts, where water had been held during the winter months. A notable feature of Mr. Glatz's crops was the purity of type maintained in the different varieties, very few foreign heads being present.

SECTION 5.

BEST 150 ACRES OF WHEAT GROWING ON LAND OTHER THAN MALLEE ON A FARM OF 640 ACRES OR OVER.

There were six competitors in the section, and all the crops shown were exceptionally fine.

Name.	Yield.	Purity.	Freedom from—		Evenness.	Total.
			Disease.	Weeds.		
Maximum Points	**40**	**20**	**15**	**15**	**10**	**100**
Alf. Sallmann	40	19	13	14	10	96
T. Feery	38	18	14	15	10	95
P. H. Muller	33	16	14	12	9	84
Ben. Ward	36	15	11	13	9	84
Warner Bros.	36	15	12	11	8	82
D. S. Anderson (withdrawn)						

It will be seen from the award of points that the contest for first place was very keen. The two leading crops were very fine, but as a spectacle Mr. Sallmann's crop was more impressive. It was sown a little earlier, and was a tall grown crop, and at the time of judging was standing well. It was exceptionally free from foreign varieties, even and dense.

Mr. Feery's crop, though not so imposing, was one that would appeal more to the wheat-grower. It was just a nice medium height, very even and dense, free from weeds, and contained very few foreign varieties; smut was entirely absent, but unfortunately it was rather badly affected with rust.

Mr. Sallmann's crop had been grown on land which had oats and barley drilled on the stubble two years before, having been put in with the combine with 100 lbs. of manure per acre. This crop was fed off during August and September. It had been summer-fallowed the following April and fallowed twice before July, when it was scarified and harrowed. It was then left till autumn, when it was harrowed three times—in February, March, and

April. It was spring-toothed in May, and the crop put in with the combine during the first three weeks of June, and harrowed afterwards. Seventy-five lbs. of Federation seed and 100 lbs. of manure were sown per acre.

Mr. Feery's crop was grown on winter fallow, ploughed during July, and harrowed and crossed immediately after. It was scarified early in October, and harrowed after a heavy rain during January. It was again scarified after heavy rain in April, and was sown with the combine at the latter end of June, putting in 90 lbs. of seed and 112 lbs. of manure per acre. Each of these crops had been sown from seed obtained from the Longerenong College two years before.

Mr. Muller's crop was grown on winter fallow, and consisted of Federation and Penny. This was a nicely-grown crop, containing very little smut, but lighter than the two leading ones.

Mr. E. Schaefer's Crop of Red Russian.

Mr. Ward's crop was of Federation, shown in two paddocks; one carrying a much heavier crop than the other, though both had apparently received similar treatment. Eighty lbs. of seed and 95 lbs. of manure had been sown per acre during June. This crop had been grown on summer fallow, ploughed in March and April, harrowed before scarifying in August. It received three scarifyings in autumn, one after rain at the end of February, another in April, and the last in front of the drill.

Messrs. Warner Brothers' crop was also a nice heavy one, a little lighter on the rising ground than on the flats. The treatment of the fallow differed from those of the other competitors, in that it had not been ploughed—the scarifier being used instead. Part had been scarified in May and part in July. It was all scarified at the latter end of that month, and again in September. It was spring-toothed twice during October and early November, and again after rains in

March. It was worked again in May and drilled with the combine during June, sowing 90 lbs. of seed and 140 to 145 lbs. of manure per acre. The later-sown crop here showed to advantage. Though shorter, it was more dense, and contained very few weeds, in comparison with the early-sown portion.

Section 7.

Best Crop of Wheat of 100 Acres, on Land other than Mallee, grown by a Farmer owning not more than 640 Acres.

Name.	Yield.	Purity.	Freedom from—		Evenness.	Total.
			Disease.	Weeds.		
Maximum Points	**40**	**20**	**15**	**15**	**10**	**100**
E. Harders	39	17	15	13	10	94
O. Hermann	36	18	15	14	10	93
W. G. Harders	37	16	15	13	8	89
C. E. Nuske	33	17	14	14	10	88
A. Ross	36	16	14	13	8	87
H. F. Budde	36	17	11	13	9	86
Leo. Nettlebeck	30	18	13	11	8	80

There was again very keen competition in this section. Mr. E. Harders' crop was a very attractive one, dense, of medium height, even and well headed. There were very few foreign varieties present, and it was comparatively free from weeds.

Mr. Hermann's crop was of Penny and Federation. The Penny was very pure and even. Like Mr. Harders' crop, there was no trace of ball smut, and weeds were almost entirely absent. The Federation was hardly as true to type, and, growing on rising ground, it was scarcely as dense as the Penny, which was growing on a heavy flat.

Mr. Harders' crop was sown with Federation seed obtained from Longerenong College two years ago—85 lbs. of seed and 85 lbs. of manure had been sown per acre. It was grown on winter fallow which had been ploughed in July, harrowed three times during August, spring-toothed early in October, and harrowed shortly after. It was harrowed again in April, spring-toothed early in May, then harrowed and a part harrowed again. It was put in with the combine at the middle of June.

Mr. Hermann had summer-fallowed, ploughing being done during March and April. The land was scarified early in July and harrowed immediately after. It was scarified in August, and again in October, then harrowed. After autumn rains it was again scarified and harrowed. Working single-handed, Mr. Hermann commenced sowing during the first week in June, scarifying before drilling. After sowing half the crop in this manner, he had the drill connected with a combine, and sowed the remainder during the third week of June. Eighty-eight lbs. of seed and manure were sown per acre.

Mr. W. G. Harders' crop was sown on winter fallow, which received five workings before harvest, and three in autumn before sowing. It

was put in with the combine during the latter part of June with 85 lbs. of both seed and manure. This crop was also free from smut, and was a nice medium height. There were few foreign varieties present, but points were lost owing to the presence of odd barley plants.

Mr. Nuske grew four varieties—Penny, Gallipoli, Huff's Imperial, and Federation. They were sown in that order with 80 lbs. each of seed and manure per acre.

Part of Mr. Ross' crop was sown on summer fallow, which had been worked up with the scarifier in April to a depth of 3 inches. The remainder had been ploughed in July. Heavy applications of seed and manure had been made—100 lbs. and 120 lbs. respectively per acre. This was also a very creditable crop. Mr. Budde's crop scored well in points, except for those deducted owing to the prevalence of ball smut. This crop had been sown at the latter end of June with 90 lbs. of seed and manure per acre.

Mr. Nettlebeck's entry consisted of 40 acres of Red Russian and 60 acres of Dollar. He was handicapped to a large extent owing to the ground being considerably lighter than that of the other competitors. The Red Russian was a nicely grown crop, though light, due to the nature of the soil. The Dollar was heavy and even at one end, but became lighter with the soil towards the other end of the paddock. Seventy-five lbs. of seed and 1 cwt. of manure had been sown per acre.

The Fallow.

SECTION 2.

BEST 150 ACRES OF FALLOW ON MALLEE LAND EXHIBITED BY A FARMER OWNING 640 ACRES OF LAND OR OVER.

There was but one entry in this section, that of Mr. E. Schaefer, who showed a 165-acre paddock, which had been ploughed in August, harrowed and cross-harrowed immediately. It had been scarified and then harrowed in September. Part had been scarified, and the balance spring-toothed at the end of October. The soil was chiefly loamy with occasional red patches. Care had been taken not to work the surface too finely, while the ridged surface left by the last working would prevent blowing to a considerable extent.

Name.	Mulch.	Moisture.	Weeds.	Cultivation.	Total.
Maximum Points	**25**	**25**	**25**	**25**	**100**
E. Schaefer	23	22	20	24	89

SECTION 4.

BEST 100 ACRES OF FALLOW ON MALLEE LAND EXHIBITED BY A FARMER OWNING NOT OVER 640 ACRES.

There was again but one entry in this section, that of Mr. J. G. Glatz. This was a 150-acre paddock, the bulk of which was loamy, but it contained a number of stiff red and grey patches. These had still been wet when ploughed, and had set into unbreakable hard lumps,

which subsequent workings had failed to break down. Apart from these patches, the remainder of the fallow was in excellent condition, and had been very thoroughly worked. Ploughing had been done during July and early August, after which it was harrowed and cross-harrowed immediately. It then received three scarifyings, one in September, the next during the middle of October, and again early in November. It was harrowed at the latter end of that month, and again after rain during the early part of December.

The surface was in nice tilth, and had worked down nicely except on the patches mentioned above.

Name.	Mulch.	Moisture.	Weeds.	Cultivation.	Total.
Maximum Points	**25**	**25**	**25**	**25**	**100**
J. G. Glatz	24	24	25	25	98

Section 6.

Best 150 Acres of Fallow on Land, "Other than Mallee," for Farmers owning 640 Acres of Land or over.

This was contested by Messrs. E. Mibus and P. H. Muller. The winner was Mr. Mibus, who exhibited a very fine fallow, the only defect being in the depth of the mulch, which was a little on the shallow side; otherwise it was practically perfect, being well consolidated underneath, free from weeds, and in fine mellow condition.

Mr. Muller's fallow was also a good one, but just lacked those minor details which were present in the winning fallow. The moisture and mulch were both good. A few weeds were present, mainly thistles. The consolidated surface was hardly as even as that on the fallow of Mr. Mibus, while the degree of consolidation was more variable.

Name.	Moisture.	Mulch.	Weeds.	Consolidation.	Cultivation.	Total.
Maximum Points	**20**	**20**	**20**	**20**	**20**	**100**
E. Mibus	19	18	20	20	20	97
P. H. Muller	19	19	17	16	18	89

Mr. Mibus had worked his fallow very thoroughly. It was summer fallow, ploughed in April, scarified in July, spring-toothed in August, scarified in September. During October it received two cultivatings with the spring-tooth, the second working being given immediately after and across the previous one. It was then harrowed straight away, and after heavy rains during the first week of December it was given another harrowing.

Mr. Muller had ploughed during August and the first week of September, and then harrowed and crossed immediately. It was scarified during October, and harrowed twice during November.

Section 8.

Best 100 Acres of Fallow on Land Other than Mallee Exhibited by Farmers not owning over 640 Acres of Land.

Name.	Moisture.	Mulch.	Weeds.	Consolidation.	Cultivation.	Total.
Maximum Points	20	20	20	20	20	100
E. T. Nuske	20	20	20	20	20	100
H. F. Budde	19	17	19	19	20	94
Geo. Nettlebeck	18	18	20	18	19	93

These three fallows were all in splendid order, that of the winner receiving the maximum points. It was all that could be desired, containing an abundant supply of moisture, well protected by a mulch of 2½ inches, regular in depth, and in a nice tilth. It was free from weeds, and had good consolidation of the underlayers. This was summer fallow, ploughed during April and May, harrowed three times during July, and again in September. It received two workings with the cultivator in October, and had been given three harrowings later—two after rains in November, and another after the early December rains.

Mr. Budde's fallow was ploughed in March, and harrowed immediately after, scarified early in May, and harrowed at the end of that month. It was scarified and harrowed during July, harrowed early in September, scarified at the end of September, and harrowed once more. In November it was scarified again, and received two more workings with the harrows, one shortly after scarifying, the other after rain at the end of the month. This fallow was in nice condition; there were a few weeds on one end of the paddock, while the only main defect was in the mulch, which was hardly deep enough.

Mr. Nettlebeck was again handicapped owing to the nature of the soil on his fallow, which was much lighter ground than that shown by the other competitors. It contained many red and grey patches, which present many difficulties in working. In awarding points, these conditions were taken into consideration. Ploughing had been done during June and July, and followed by the harrows. It was scarified and harrowed during September, and received similar treatment in October. It was again harrowed after rain early in December. Considering the nature of the soil, this fallow was in good condition. There were no weeds present, and on the more fertile portions the mulch was in good order and protected a good supply of moisture below.

The Crops.

All the crops exhibited were of a high standard. Those winning in the various classes were exceptionally fine, and reflected the up-to-date methods which are generally practised throughout the district. In such a favorable season, the response of crops to any special treatment they may have received is considerably modified. This has been especially noticeable in the manurial trials conducted in various parts of the

Wimmera. A review of the treatment of the winning crops, however, shows that heavy applications of seed and manure have again scored heavily.

Competitor.	Class of Land.	Time of Fallowing.	Quantity of—	
			Seed.	Manure.
E. Schaefer ..	Mallee	July	100 lbs.	100 lbs.
G. Howland ..	Mallee	July	90 lbs.	94 lbs.
A. Sallmann ..	Heavy black soil ..	April	75 lbs.	100 lbs.
E. Harders ..	Heavy black soil ..	July	85 lbs.	85 lbs.

Scarifier, with weed-knife attached, specially suited to deal with paddy-melons.
(Working on Mr. D. S. Anderson's fallow.)

Mr. Schaefer's land is only a medium strong soil, yet he finds the heavy seeding and manuring profitable, and it is to these factors that he attributes the density of his crop this year, which compared very favorably with many crops grown on heavy soil.

Mr. Howland applied a heavy seeding, and a fairly heavy dressing of manure. His soil was strong Mallee, and the crop was a very fine one.

While Mr. Sallmann's crop was sown with 100 lbs. of manure, it must be remembered that a large proportion of that sown with the grazing crop before fallowing was still available for the wheat crop. This was a splendid crop, and has been described previously, while Mr. Ferry's crop, placed one point behind it, was sown with 90 lbs. of seed and 112 lbs. of manure per acre.

Mr. Harders' crop was sown with a lighter quantity of manure; it was well seeded, however, and was grown on a heavy black flat. As has been previously pointed out, the season modified the effects of heavy manuring, but tests conducted over a number of years show that, while the differences are less marked in good seasons, the heavy applications

of manure up to 2 cwt. per acre prove so profitable in less favorable seasons that the average yield per acre over a number of years is several bushels in their favour.

The cropping systems adopted throughout the district leave little to be desired. Summer fallowing, which has shown up so conspicuously among the winning crops throughout the Wimmera of recent years, is widely practised, while late sowing, another important factor to success, has taken its place in the routine.

A number of crops inspected were entirely free from smut, and others were only slightly affected. There were several, however, which were infected to such an extent as to materially affect the yield. As all the crops were sown with pickled seed, it can only be inferred that in some cases pickling had not been done carefully.

Mr. A. Sallmann's Home.

Methods of pickling are detailed in the report of last year's competition by the Chief Field Officer, Mr. H. A. Mullett, and if these instructions are followed there should be no risk of smut occurring in the ensuing crop. It is a wise precaution to soak the bags in the pickle also, as re-infection frequently takes place from this source. Where the crop has been smutted the previous year the drill should also be disinfected with a formalin solution (1 in 400).

The Fallow.

The wide variation in the nature of Mallee soils prevents any definite routine being practised in fallowing. The stronger Mallee soils respond to thorough cultivation, but in working this class of land the condition of the fallow has to be closely watched if the best results are to be obtained.

On the more sandy soils the common practice is to harrow after ploughing, and then spring-tooth only when necessary to control the growth of weeds. The ridged surface left by the spring-tooth helps to prevent "blowing" to some extent, especially if worked at right angles to prevailing winds.

Fallowing on Heavy Soils.

The success of summer fallowing and the more even distribution of the work in so doing has led to its popularity throughout the Wimmera, and it is the exception to meet with a farm where at least a portion of the land is not summer-fallowed.

While there is a general similarity in the methods employed in working the fallows, there are occasional minor variations in methods which lead to wide differences in results.

It is frequently noticed that one farmer will bring his fallow into excellent condition with a far less amount of work than another. A case in point is the fallow exhibited by Mr. E. G. Nuske. This was in perfect condition, and though it received six harrowings altogether, it had been but twice worked with the cultivator—given in succession during October.

A fault most commonly met with is an insufficient depth of mulch. In order to afford protection to the underlayers during summer and autumn months, it is necessary that this covering or mulch should be 2½ inches deep. If the depth be less the ground in a normal season will crack in autumn, and big losses of moisture through evaporation occur. This is a point that has to be closely watched when the spring harrowings are given. The harrows are very effective in consolidating the underlayers, caused by the fine particles of soil running down to the points of the tynes, where they quickly settle and bind together. When it is intended to harrow frequently, it is necessary to make the early spring working a deep one. Mr. Nuske's success is due to this. In cultivating twice, the second immediately after the first one and across it, be worked deeply—a good 3 inches—so that after the subsequent harrowings, not only was the fallow well consolidated below, but a good depth of mulch still remained to prevent evaporation.

The combined cultivator drill is becoming a very popular implement for working the fallow, and is specially adapted for late spring workings. For this purpose the 4-inch points are used. These deal effectively with young weeds, and at the same time cut the mulch out to the required depth without opening up the soil to the same extent as the scarifier, while the finely-ridged surface left after working prevents the fallow being beaten down by heavy rains—a feature which was noticeable on many Wimmera fallows this season. These fallows had been harrowed after rain in November, but heavy rains a fortnight later had flattened the surface badly, and, occurring in the middle of hay carting, time could not be spared to give the harrowing which was needed to prevent the fine surface from settling down.

I desire to thank the President and officers of the Society, especially the Secretary, Mr. C. Bennett, for the arrangements made in connexion with the judging, which, with the co-operation of the competitors, enabled the work to be carried out so successfully and pleasantly.

FALLOW COMPETITION, BEULAH, MARCH, 1922.

Report of the Judge, J. Keane, B. Ag. Sc., Science Field Officer.

The judging of the annual fallow competition conducted by the Beulah Agricultural and Pastoral Society took place in March, having been postponed owing to heavy rains during the judging of the crops last November. The competition was again divided into two sections, Section I. being confined to returned soldier settlers, while Section II. was open to all farmers of the district.

Since 4th December to the time of judging (March) only 34 points of rain had been recorded at Beulah, so that the fallows were subjected to a severe test. Consequently the only ones showing a high moisture content were those which had been judiciously worked and were protected by a good mulch.

With the light sandy soils of the Mallee one of the greatest difficulties in fallowing is to prevent the surface mulch from drifting. In many cases the whole of the loose sand is blown from the fallow into adjoining paddocks or on to the roads. That this drifting can, to a considerable extent, be avoided was one of the principal features noticed during the judging of the competition this year. In several cases neighbouring fallows, on the same class of land and under exactly similar conditions, were observed in which one had a nice, well-formed mulch, with practically no drifting, while on the other the whole of the loose surface soil had been blown away. The difference in each case was due to the methods employed in working the fallows. Where the surface had been left in a fine level condition by the harrows there was nothing to hinder the movement of the sand, with the result that after a dry spell the first heavy winds caused drifting.

On the other hand, where the surface had been worked last with the spring-tooth cultivator, the ridges left by this implement intercepted any moving sand, and drifting was reduced to a minimum, particularly where the ridges were across the direction of the prevailing winds.

A few of the fallows shown were badly infested with paddy-melons. In some cases these were being eaten off by horses and sheep, neither of which appear to suffer any ill-effects providing they are not confined to the paddy-melons, but have access to grass or stubble paddocks at the same time. A statement often heard is that paddy-melons are a good sign on a fallow, as they show that there is plenty of moisture present. But the important thing is to keep the moisture in the fallow, and where weeds of any kind are growing they are using up that moisture and robbing the succeeding wheat crop.

Details of Results.

SECTION I.—BEST 100 ACRES OF FALLOW, FOR RETURNED SOLDIER SETTLERS ONLY.

In this section there were ten entries. Considering the dry season and the fact that the settlers were too busy with the haymaking to get on to the fallows after the rains in November and early December, those shown were of a high standard, and reflect considerable credit on these new settlers.

TABLE I.

Name.	Moisture.	Mulch.	Cultivation.	Weeds.	Total.
C. Hunt, Beulah West ..	22	22½	22	21½	88
J. Nunn, jun., Reedy Dam..	22	21	23	20	86
J. Bryant, Beulah ..	20	21	20	24	85
P. Lawler, Reedy Dam ..	21	22	22	19	84
C. H. Guley, Beulah West..	20	22	20	21	83
F. Cullen, Beulah West ..	18	22	20½	20½	81
J. Hunter, Brim	19	21	21	17	78
E. Pendlebury, Goyura West	17	20	20	21	78
M. Carmichael, Goyura West	17	18	19	23	77
V. P. Smith, Beulah West..		With	drawn		

Mr. C. Hunt's fallow, which is awarded first place, consisted of 60 acres of summer fallow, plus 40 acres which have been under fallow since July, 1920, Mr. Hunt not having had time to sow this portion last year.

The 60 acres of summer fallow had been ploughed in January, then harrowed after a rain in April. In July the whole paddock (which consists of 200 acres) was spring-toothed. As the paddock is not fenced, sheep could not be run on the fallow, so that the implements had to be kept going to keep the rubbish down. After the spring-tooth the paddock was scarified, then skim-ploughed, and finally given three more workings with the spring-tooth, the last being at the end of November. The 40 acres which were ploughed in July, 1920, are on the way home from the larger paddock, and have been intensively worked. The fallow. which was protected by a good mulch, had a well consolidated, fairly level bottom and a high moisture content. There were a few paddymelons present.

Second place goes to Mr. J. Nunn, jun., who showed a very good fallow, and third place to Mr. J. Bryant.

The remaining fallows lost points for such faults as low moisture contents, inefficient mulches, and the presence of weeds.

SECTION II.—BEST 100 ACRES OF FALLOW—OPEN TO ALL FARMERS OF THE DISTRICT.

Name.	Moisture.	Mulch.	Cultivation.	Weeds.	Total.
A. T. Couzner, Galaquil ..	23	23	22	24	92
W. T. Fish, Beulah ..	22½	22	23	23	90½
C. Hunt, Beulah West ..	22	22½	22	21½	88
W. J. Collins, Beulah ..	19	22	22	23	86
J. Bryant, Beulah ..	20	21	20	24	85
A. E. Jende, Beulah ..	18	20	20	24	82
W. McAllister, Galaquil ..	18	19	19	25	81
E. V. Schneider, Beulah ..	18½	21	20½	20	80
F. H. Marshman, Brim ..	18½	20	20½	20	79
Schneider Bros., Beulah ..	19	20	21	19	79

The first place is awarded to Mr. A. T. Couzner, who showed 100 acres of excellent fallow. The moisture content was, considering the season, extremely good, and the fallow was protected by a well-formed, mellow mulch. Very few weeds were present.

The land was worked up with the scarifier during July, and harrowed immediately after. It was again scarified during August and September, with the harrows dragging behind. This was followed by the spring-tooth, and another stroke of the same implement was given in November. The last working of the cultivator was in a north-and-south direction, leaving ridges at right angles to the prevailing westerly winds. This has effectively prevented any drifting.

The second prize fallow, shown by Mr. W. T. Fish, consisted of two 50-acre paddocks. One of these was practically an ideal fallow, while in the other the mulch was set down in places, and consequently some of the moisture had been lost by evaporation.

Mr. C. Hunt obtains third place with the fallow already described under Section I.

The other competitors all showed good fallows, but lost points for similar faults to those under the previous section.

In conclusion, I desire to thank the secretary, Mr. A. J. Williams, Mr. W. J. Wallsgot, and Mr. Redding for their assistance and co-operation during the judging of the competition.

SOME RESULTS OF EXPERIMENTAL WORK OF THE FIELD BRANCH, DEPARTMENT OF AGRICULTURE.

Increasing Wheat Yields.

RESULTS OF MANURIAL EXPERIMENTS IN WESTERN WIMMERA.

There are several millions of acres of light soils in the south-west portion of the County of Lowan, which are mainly used for grazing purposes. Some wheat and oats, however, are grown in the vicinity of Goroke. A few years ago, the Closer Settlement Board acquired a number of large estates in the district, and settled them with returned soldiers, who, in many cases, are growing a proportion of cereals. Portion of Mortat Station was settled in this way. Before this estate was subdivided, the Agricultural Department, at the instance of the local Agricultural Society, secured 10 acres of the land, and established an experimental plot. This area was fallowed in 1920, and the results of the first crop are now to hand.

RESULTS.—Plots, each ¼ acre. Sown 26th May, on fallowed land, with Federation wheat, at the rate of 70 lbs. per acre—

Treatment.	Yield per Acre.
No manure	5·9 bushels per acre.
Superphosphate, 1 cwt. per acre	14·7 " "
Superphosphate, 2 cwt. per acre	19·3 " "
Basic phosphate, 1 cwt.	13·3 " "
Superphosphate, 1 cwt., and gypsum, 1½ tons, per acre	24·8 " "

The benefit conferred by phosphatic manures of the water soluble type is well known to Victorian agriculturists, but the results obtained in this district are more marked than elsewhere. It is evident that here successful crops could not be grown without the aid of manure. A dressing of 1 cwt. of superphosphate increased the yield by 8 bushels per acre, or practically 150 per cent. When 2 cwt. of superphosphate was applied, the increase was 13.4 bushels per acre, or 227 per cent. Basic phosphate, a manure of rather less soluble character, also gave a substantial increase, but not so good as an equal quantity of superphosphate. The best results of all were obtained by the use of gypsum with superphosphate. Thus the plot treated with gypsum 1½ tons, and superphosphate 1 cwt. per acre, yielded 24.8 bushels per acre, an increase of 18.9 bushels as compared with the unmanured plot, and 10.1 bushels per acre more than where superphosphate was applied by itself.

This is the first instance in Victoria, in official tests with wheat, where gypsum has given such beneficial results. The reason for its success at Goroke is probably due to its favorable action in ameliorating a cement layer which exists at about a foot deep under the light soils there.

Notwithstanding, however, the success of gypsum, the application of superphosphate at the rate of 2 cwt. per acre by itself proved the most profitable dressing. Valuing the wheat at 4s. a bushel, and the superphosphate at 6s. 6d. a cwt., the net profit due to the use of 2 cwt. of superphosphate amounted to 40s. 7d. per acre, after paying for the fertilizer out of the increased crop. The average application of superphosphate used in the district is about 80 lbs. per acre. In view of these results, obviously, it could be increased with substantial profit.

With regard to gypsum, its high price at the present time is due to the limited demand. Large supplies exist naturally in the Mallee, and it is probable that if efficient handling methods were installed, the price could be considerably reduced.

It may be pointed out, too, that it is not likely that the dressing of gypsum will have to be repeated for a number of years; hence, the cost per annum is considerably reduced.

The following table sets out in detail the net profit due to each dressing of manure tried:—

Treatment per Acre.	Increase due to Manure.	Value of Increase, at 4s. per Bushel.	Cost of Manure.	Profit per Acre due to use of Manure.
	Bushels.	*s. d.*	*s. d.*	*s. d.*
No manure	..	..	..	..
Superphosphate, 1 cwt. per acre ..	8·8	35 2	6 6	28 8
Superphosphate, 2 cwt. per acre ..	13·4	53 7	13 0	40 7
Basic phosphate, 1 cwt.	7·4	29 7	6 0	23 7
Superphosphate, 1 cwt.; gypsum, 1½ tons	18·9	75 7	81 6	5 11 loss
Recalculated profit, assuming gypsum lasts five crops.				
Superphosphate, 1 cwt.; gypsum, 1½ tons	18·9	75 7	21 6	54 1 profit

Prolific Wheat Crops.

Results of Experimental Work at Nhill.

The results of the experimental plots conducted for the Department of Agriculture by Mr. W. E. Dahlenburg on his farm at Salisbury, are now to hand.

The plots were sown on well-worked fallowed land, and some splendid yields were harvested. The whole field of about 6 acres averaged 46.6 bushels, including two-thirds of an acre sown without any manure. The new Departmental crossbred, Gallipoli, gave the best yield, viz., 51.4 bushels per acre. The average for the past two years at Salisbury for this variety is 52.95 bushels per acre. Wannon, a new selection from Federation, was next best with 50.7 bushels per acre. The following table indicates the results:—

Plots, each one-third of an acre in area. Sown 27th June, 1921, with 75 lbs. wheat, and 1 cwt. superphosphate per acre—

Gallipoli	51·4 bushels per acre.
Wannon	50·7 „ „
Huff's Imperial	49·8 „ „
Federation	46·5 „ „
Dollar	46·4 „ „
Penny	45·2 „ „
Crossbred L7063	44·7 „ „

Note.—H. Huff's Imperial, raised by Mr. A. Huff, of Dooen, closely resembles Wannon, but there appear to be slight points of difference. Crossbred L7063 looked very promising, but the grain was somewhat pinched.

A further series of tests was conducted with various dressings of phosphatic manure applied to Federation wheat. Portion was sown at the normal seeding time for the district, and an identical portion a month later. The results were slightly in favour of the later sowing for most of the applications made. Details of the results are appended:—

Federation Wheat Manured as under—	Yields per Acre of Plots Sown normal Sowing time, 18.6.21.	Yields per Acre of Plots Sown one month later, 18.7.21.	Increase due to Late Sowing.
	Bushels.	Bushels.	Bushels.
No manure	41·9	43·8	1·9
Superphosphate, ½ cwt. per acre	45·3	45·3	Nil
Superphosphate, 1 cwt. per acre	45·3	46·2	·9
Superphosphate, 1½ cwt. per acre	47·4	48·2	·8
Superphosphate, 2 cwt. per acre	47·3	46·8	Decrease ·5

It will be noticed, incidentally, that the yield of the plot untreated with fertilizer is extraordinarily high, as was the case on this field the previous year. It is a result which is most uncommon in the Wimmera, and one which is probably accounted for by the favorable growing

weather experienced at Nhill late in the season, as well as to the residual effect of a heavy dressing of manure given this field when it was last cropped. The most profitable dressing of fertilizer applied was 1½ cwt. in both series of plots, as shown by the following table. This is considerably in advance of the amount used locally. The response to manure generally was lower than that which is usual in the Wimmera.

Profit Shown by Manures Applied to Federation Wheat Sown 18th June, 1921.

Normal Seeding Time.

Federation Wheat Manured as under—	Increase due to Manure.	Value of the Increase at 4s. a Bushel.	Cost of Fertilizer.	Extra Profit due to Manures.
	Bushels per acre.	s. d.	s. d.	s. d.
No manure	..	..	..	..
Superphosphate, ½ cwt. ..	3·4	13 7	3 3	10 4
Superphosphate, 1 cwt. ..	3·45	13 9	6 6	7 3
Superphosphate, 1½ cwt. ..	5·55	22 2	9 9	12 5
Superphosphate, 2 cwt. ..	5·45	21 9	13 0	8 9

An area of fallow sown to Sudan grass was not a success. Wimmera Rye Grass made prolific growth, and yielded 20 bushels per acre.

A trial was also made of Mr. Reichelt's patent drill, which sows wheat in rows spaced at half the usual distance. The test was in favour of the patent drill by 2 bushels to the acre.

New Wheats for the Mallee.

Twelve years ago, the Government threw open a large area of new Mallee land in the vicinity of Ouyen and along the new railway line from Ouyen to Murrayville. The land was previously regarded as an uninhabitable arid waste; but, as a result of the settlement, a prosperous wheat-growing community has established itself. Some 450,000 acres are now sown to wheat, which, in 1920, was valued at £2,000,000 sterling.

The climate in the locality was drier than in any hitherto settled in this State as a dry-farming area, and with a view to providing special wheats for the district the Agricultural Department instituted a set of experimental plots at Cowangie and one at Carwarp. The results for the season 1921 are now to hand. They show that three of the new Departmental crossbreds have given excellent results as compared with the types usually grown.

The experiments at Cowangie are conducted on the farm of Mr. H. F. Hecht, and at Carwarp on the farm of Mr. P. G. Stewart, M.H.R.

Those at Cowangie were sown on fallow, and those at Carwarp on stubble land. Owing to the hot winds experienced early in November,

the grain was somewhat pinched, and consequently yields, though good for the district, are less than were expected.

RESULTS, 1921.—AVERAGE YIELDS OF WHEAT AT COWANGIE AND CARWARP.

Sown with 45 lbs. seed and 60 lbs. superphosphate, on plots each 1 acre in size.

New Crossbred, Indian E x Telfords	16·5 bushels per acre.
New Crossbred, Indian F x Federation	16·0 ,, ,,
Canberra	14·9 ,, ,,
New Crossbred "Gallipoli"	14·5 ,, ,,
Federation	14·0 ,, ,,
New Selection "Wannon"	12·1 ,, ,,
Penny	11·9 ,, ,,
Dart's Imperial	11·9 ,, ,,
Mac's White	11·7 ,, ,,

Algerian oats sown on fallow at Cowangie yielded 46·2 bushels per acre.

AUSTRALASIAN BUTTER QUALITY.

Commenting on the quality of recent arrivals of Australian and New Zealand butter on the San Francisco market, the *Pacific Review* says:—

"Butter-makers and creamery men, and we might also include dairymen, who get a chance to examine some of the butter that is arriving from Australia and New Zealand should not overlook the opportunity. We might as well admit it, our Antipodean brothers have it on us when it comes to quality and uniformity of product. When butter can make the long 8,000-mile trip, which requires 30 days in a steamer refrigerator, and arrive in the excellent condition that this butter is in, we are prone to wonder what it was like before it started on the journey. It also calls to our mind the fact that some years ago, as a result of drought in Australia, California shipped some butter down there, the quality of the most of which was a great disappointment when it arrived. The fact is that at least 25 per cent. of the butter made in this country in one week after it leaves the churn is not up to the butter from New Zealand and Australia after it arrives in this country. "How do they do it?" That is the question we asked in these columns several weeks ago. It seems to us it is high time we sent some of our butter-makers and teachers of butter-makers down there to find out. Our leaders in dairy education have laboured under the idea that their education is not complete without a trip to the dairy countries of Europe. They should include New Zealand and Australia, for those countries evidently know how.

TOBACCO FOR VICTORIANS.

(Continued from page 107.)

By Max Valentine, Field Officer.

Flue-curing Bright Tobacco.

It is impossible to specify a fixed schedule of times and temperatures which will successfully flue-cure all barns of Bright tobacco, inasmuch as varying climatic conditions and differences in the State of the tobacco of each barn will have to be considered; but there are fundamental principles, applicable to all varieties, which must be remembered. Each barn-full of leaf must be treated individually, therefore everything will depend on the judgment of the curer, who will need to be constantly on duty during the whole operation.

The thermometer, which is hung in the centre of the lowest tier, must be used only as a guide, more attention being paid to the changing condition of the leaves and to the humidity of the atmosphere in the barn than to the actual number of degrees of heat registered. The expert curer scarcely needs a thermometer at all, as he is able, through long practice, to realize the exact temperature or amount of ventilation which is required at any period immediately upon entering a barn and glancing over the contents. His decisions regarding the necessary heat, &c., are governed by the condition, at the time, of the bulk of the tobacco visible, it being unwise to risk spoiling the majority of the leaves for the sake of a few which may, and generally will, cure slower or quicker than the rest.

The curing process may be roughly divided into four periods, *i.e.*, the period in which, firstly, the leaves "yellow" or "colour"; secondly, when the colour is "fixed"; thirdly, when the mid-rib is dried out; and, fourthly, when the main stalk of the plant is also dried out.

The first period takes place while the plant is yet living, but is slowly approaching death from starvation, owing to the food and moisture supply being cut off. During this period it is necessary to preserve the life (cell activity) and some of the moisture, because as soon as the leaf is dead, or dry, very little change of colour takes place. In order to do this, all the ventilators of the barn must be closed tightly, and there must be just sufficient heat to keep the leaf soft and warm. A humid atmosphere is the required result. The temperature should range from 80 deg. F., at the start, to 110 deg. F. when the process is nearing completion. The temperature must not be raised more than 2 deg. an hour at any time. The length of this period will normally vary from 36 to 48 hours, except in the case of extra heavy tobacco, or that cut rather green, which may take three, or even four, days to obtain the desired colour.

Tobacco is sufficiently "yellowed" when the leaf is a bright lemon colour, streaked with green along the mid-ribs and veins. If "yellowed" too much, the leaf will become reddish and darker when dried and bulked down. Some of the riper leaves will "yellow" quicker than the others, and will begin to "sweat," or give off moisture, which must be evaporated before it can lodge on the face of the leaf.

Where excessive moisture remains for any length of time on a leaf, discolouration, known as "scalding," will take place. Therefore, as the "yellowing" period progresses, it will be necessary to create a current of dry air through the barn, sufficient to carry off all excessive moisture, by partly opening the ventilators at the top and bottom. This will usually take place when the temperature is about 110 deg., and when some of the leaves have begun to curl up at the tips. When the bulk of the tobacco is "yellowed," the temperature should be raised at the rate of 2½ deg. an hour to approximately 125 deg., and it must be held there until the curer is satisfied that all the leaves are of the desired colour.

As the second period is being approached, it will be found that, with a temperature of 120 degrees, some leaves have already dried out, while others are still soft and pliable. The colour will not be "fixed" until the leaf is so dry that it will crumble to pieces if squeezed in the hand. The temperature must be steadily increased to about 135 degrees, and held there until the leaves are in this state.

The mid-ribs may yet be quite soft, and so the third period will be necessary to kill them out. The temperature should be increased as before at the approximate rate of 2½ degrees an hour up to 145 degrees or 150 degrees, and kept steady until each mid-rib is dry and brittle so that it would snap off if twisted back against the main stalk. During this period, the ventilators at the bottom of the barn can be closed, and that at the top partly closed, in order to economize fuel.

For the fourth period, the temperature is rapidly raised at 5 degrees an hour to 175 degrees, and held there until every main stalk is thoroughly dried out. An even higher temperature can safely be used if it be desired to hurry the process, in the event of the barn being wanted at once for a further lot of tobacco; but it is not advisable to go beyond 195 degrees. Before extinguishing the furnace fires and cooling off the barn preparatory to removing the tobacco, the curer must satisfy himself that every stalk is quite dead, as the presence of a few green stalks in a bulk of cured leaf may cause leaves near it to sweat and mildew.

It will be found that, to cure a barn of tobacco by the method here explained, anything from four and a half to seven days will be required, and the wise grower will take the precaution of providing sufficient barns to cure his crop without having to hurry the operation. Tobacco is more often imperfectly cured by hurrying through the process, particularly the "yellowing" period, than by running slightly on the slow side.

If the foregoing remarks are kept clearly in mind, the following table of approximate temperatures may be used as a rough guide for

the flue-curing of a normal crop of Bright tobacco under normal climatic conditions (warm, dry weather) :—

1st period.—" Yellowing."—Time, 36 to 48 hours. Close all ventilators. Start temperature at 80 degrees F., increasing after 24 hours at the rate of 2 degrees an hour to 105 degrees. If leaf now begins to sweat excessively, partly open vents top and bottom. Hold at 110 degrees till tips of leaves begin to curl; then increase temperature at rate of 2½ degrees an hour to 120 degrees. Hold till desired colour is reached.

2nd period.—" Fixing the Colour."—Ventilate freely, and raise temperature 2½ degrees an hour to 135 degrees. Hold till leaf is dry.

3rd period.—" Drying the Mid-rib."—Close bottom vents, and partly close top vent. Raise temperature 2½ degrees an hour to 145 degrees. Hold till mid-ribs are dried.

4th period.—" Drying the Stalk."—Raise temperature 5 degrees an hour to 175 degrees. Hold till all stalks are thoroughly killed.

THE PRESERVATION OF FRUIT JUICES.

To a request for information regarding the preservation of fruit juices, Miss Knight, Fruit Preserving Expert, replies as follows:—

Sound fruit only should be selected. Strain the juice into clear sterilized bottles to within, say, an inch and a half of the top; this space is necessary for the expansion of the liquid when heated.

Heating or pasteurizing is best done in a double boiler. If desired, the household washing copper may be conveniently used. It should be fitted with a wooden frame or stool to prevent the bottles from coming into direct contact with the bottom of the vessel. (A full description of these frames is given in the Bulletin on Bottling and Drying of Fruit, which will be supplied free on application.)

The filled containers may be stood on the frame, and the copper or boiler filled with water to within one inch of the top of bottles. Heat the water gradually, and allow it to simmer for about 30 minutes (according to the size of containers). If a thermometer is used, heat the juice (inside the bottles) to from 140 deg. Fahr. to 150 deg. Fahr., and retain that temperature for from 30 to 40 minutes, then cork and seal, cool off, and store.

To cork the bottles. Good, deep, new, sound corks should be used. They should be first steeped in boiling water for 20 minutes or so. These are forced into the necks of the bottles so that they fit very tightly. They are then cut off level, and the tops of bottles and corks covered by dipping them into melted paraffin or other seal.

If preferred, fruit juices may be preserved without heating by the addition of any one of various preservatives prepared according to " regulations and standards for foods and drugs." Preservatives, either liquid or powders, are procurable from several city firms.

WEEDS AND THEIR ERADICATION.

(Continued from page 169.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

The Red Ink Plant, *Phytolacca octandra*, L., Phytolaccaceæ.

This handsome plant delights in a good soil, and given this and plenty of moisture, grows into a very large, spreading bush.

The Red Ink plant derives its name from the very brilliant colour of the juice, similar in appearance to the bright scarlet of red ink, contained in its numerous black fruits.

Fig. 28.—Flowering Stem of Red Ink Plant.

It is a perennial, and is said to be a native of Mexico. It can easily be identified by its spikes of insignificant whitish flowers, tinged with green (Fig. 28), the red colour of most of its stems, and later, when in fruit, by the numerous black berries (Fig. 29) which are shown on the spray on the right-hand side of the illustration; the spray on the left is carrying both flowers and fruit.

Young specimens can be hand-pulled, but with old-established plants, this is impossible. These large bushes should first have their tops killed by an arsenical spray, after which the roots should be dug out.

Fig. 29. Fruit of Red Ink Plant. Spray with both fruit and flowers.

Another method is to cut them off below the surface of the ground and apply a liberal dressing of dry salt to the cut surface of roots.

This plant is proclaimed under the Victorian Thistle Act for the shires of Melton, Werribee, Bacchus Marsh, and Ballan.

The Prickly Lettuce,

Lactuca scariola, L., Compositæ.

This genus contains the common lettuce so largely grown for salad purposes.

The Prickly Lettuce is a useless species, indigenous to England, and, in all probability, was introduced into Victoria with impure seed.

As can be seen in Fig. 30, it has nearly perpendicular leaves, of a stiff, hard nature, and wavy edges. The leaves grow alternate on the stem, and are sessile, clasping the stem with an ear-shaped lobe or auricle (Fig. 31). The underside of midrib of leaves usually has numerous prickles on it.

Fig. 30.—Prickly Lettuce.

The flower stem (Fig. 32) ranges from 1 foot to 5 or 6 feet in height or even more, and has numerous heads of bloom, of a pale yellow colour, producing an enormous number of seeds, which, when ripe, are borne away with every puff of wind.

The prickly nature of the stem is shown in Fig. 33.

The plant is an annual, and, like many other annuals, is very troublesome and difficult to deal with once it has been allowed to seed freely.

In "The Weeds of New South Wales," by J. H. Maiden, the following reference to this plant is of interest:—

> "A whole countryside can be sown by one gust of wind from a few plants; hence it is difficult of control by man. If a man's land were free of it to-day, he cannot tell whether it will be not sown with it to-morrow."

The Farmers' Bulletin 28, Department of Agriculture, United States of America, quoted by the same authority, says of this plant:—

> "A most pernicious weed; a single average plant has been found to bear more than 8,000 seeds."

It is not yet proclaimed under the Victorian Thistle Act, but from the

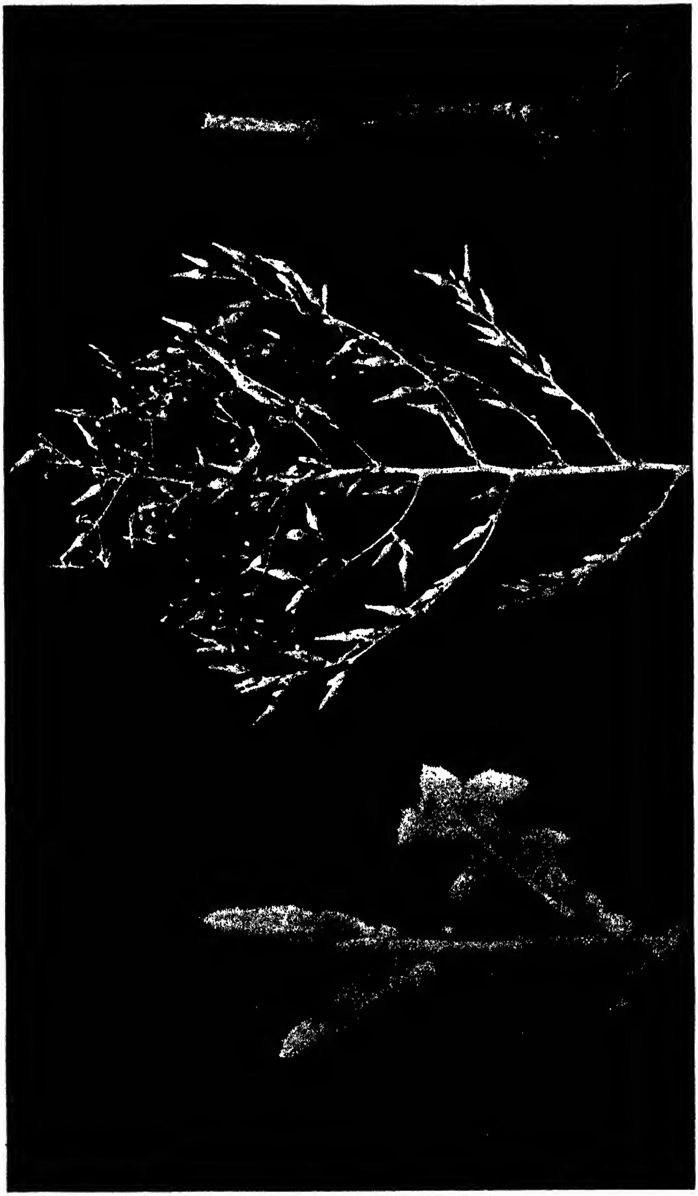


Fig. 31.—Leaves of Prickly Lettuce showing prickles.

Fig. 32.—Portion of flower stem of Prickly Lettuce.

Fig. 33.—Portion of stem of Prickly Lettuce showing its prickly nature.

Fig. 34.—*Amaranthus retroflexus*.

Fig. 35.—Portion of flower stem of *Amaranthus retroflexus*.

way in which it is establishing itself in some parts of the State, it probably will be in the near future.

Prickly Lettuce is not easily hand-pulled when found growing in hard ground; it usually breaks off a few inches above the surface, allowing the plant to throw up a fresh flower stem.

Unlike most annuals, it is often troublesome on grass lands, and the writer recently found the stumps of this plant growing fresh flower stems in a lucerne paddock that had just been cut for hay.

When the lettuce plants are young, both sheep and cattle should be useful for the purpose of feeding them off; but, when older, they become very bitter and woody, and would then most likely be rejected by stock. Even if cattle would eat the older plants, the bitterness of the leaves would probably badly taint the milk of dairy cows.

In cultivated land the plants should be either hand-pulled or hoed out, and on no account allowed to run to seed. Usually, by the end of February, the seeds have matured, and been carried away by wind—many of them to other localities.

For controlling such a plant as this, co-operative destruction in the whole district, on roadsides, railway banks, and waste lands is necessary before the flowers reach the seeding stage.

It is for weeds such as this that the provisions of the Thistle Act should be strictly enforced against the land-owner who is careless concerning both his own and his neighbour's welfare. During the summer, even the least observant will see wind-borne seeds such as those of the Prickly Lettuce being carried in every direction. There are weed nurseries, in some instances, on vacant allotments in country towns, where the destruction of the plants would involve the owners in very trifling trouble or expense. Even if total eradication of weeds on these allotments was not insisted upon, it should, at the very least, be made compulsory to keep weeds from maturing seed which later on may infest a whole countryside.

Amaranthus retroflexus, L., Amaranthaceæ.

This common weed, which is an annual, appears to follow cultivated ground, and is often introduced by means of impure seed. It is a great nuisance when growing among vegetables, robbing the soil of its moisture as well as shading the crop.

Where cultivation is practicable, it may be easily destroyed, but elsewhere it is difficult to exterminate, owing to its being such a heavy seeder and the great vitality of the seed, which it is said will remain viable after being buried in the soil for thirty years, or even longer. Great care should be taken, therefore, to prevent the seed from ripening, and all plants in flower or seed should be gathered up and burnt.

Fig. 34 shows a small specimen which was hand-pulled, and Fig. 35 is a portion of a flowering stem.

(*To be continued.*)

THE CULTIVATION OF HOPS.

(*Humulus lupulus.*)

By Temple A. J. Smith, Tobacco Expert.

Though the growing of hops for profit has been an industry for many years in Victoria, it has not, up to the present, reached much prominence, and has suffered many fluctuations, but now appears to be making some headway.

In the past, the quality of the Victorian hops was considered inferior, but the adoption of better systems of growing and curing, together with the use of new varieties suited to soils and climate, have so improved the quality that they are now considered equal to, if not superior to, the Tasmanian.

In 1883-84, 1,758 acres were under cultivation, yielding 15,717 cwt. This was the maximum production in any one year for this State. After this, for various reasons, principally low prices, the area dropped to 71 acres, with a yield of 522 cwt. in 1918-19; since which year the area has been gradually increasing, and some fine returns have been taken.

The Counties of Delatite, Bogong, Dargo, Polwarth, and Buln Buln, are those in which hops are grown, by far the greater part, however, being in Delatite and Bogong.

Soils.

Hops thrive best in rich, alluvial river or creek flats of fair depth, with good natural drainage, where irrigation can be used, and in climates not liable to drought or late frosts, and where strong winds are not common.

Deep cultivation is necessary in order to allow the roots easy penetration, and subsoiling to a depth of 2 to 3 feet is advisable.

Propagation.

Propagation is accomplished from seed or cuttings, the latter being called sets, the usual practice followed in establishing a hop plantation being to secure sets from an old and successful garden. Failing this course, the seed can be sown, and sets taken from the roots the next year and planted in September. The sets or cuttings are planted in hills 7 to 10 feet apart, and strikes up to 98 per cent. are general, the wider rows generally producing better quality but a lesser quantity.

Trellising.

Systems of training vary, and the old fashion of placing three poles to each hill is now being abandoned for the better system of trellising on permanent poles, on which wires are stretched from end to end of the plantation, and strings taken from each hill and attached to the wires on the poles. These poles average about 6 to 8 inches in diameter, and 10 feet in height. They should be deeply placed in the ground, and strongly braced to sustain the weight they will be required to carry.

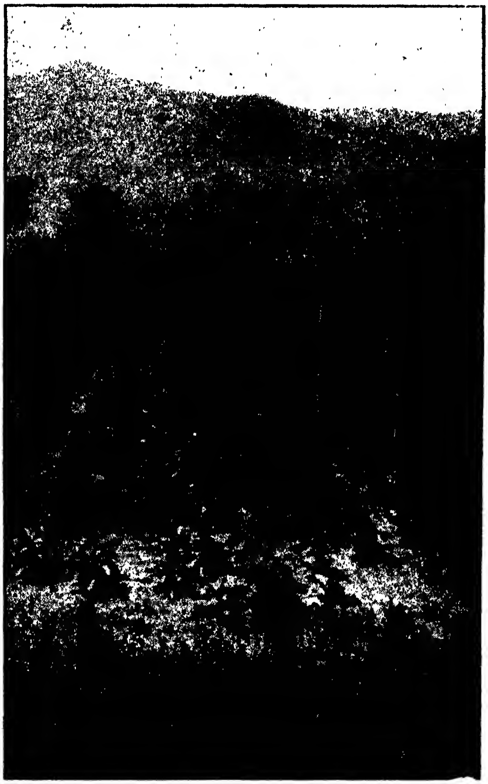
The cost of erecting trelliswork is estimated at from £40 to £60 per acre. Room for turning with the plough and cultivator should be left at the ends of the plantation, from 18 to 20 feet being required.

Manuring.

Fertilizers and manures are freely used in quantities of half a ton of bonedust to the acre; and farm manure, when obtainable, 30 loads per acre.

Training the Vines.

The first year the young hop is trained up a single string, but in subsequent years, three strings to each plant are used. The yield from a first-year crop is from 5 cwt. to half a ton per acre, and later, when the hop is well established, 1 ton per acre is considered a good crop.

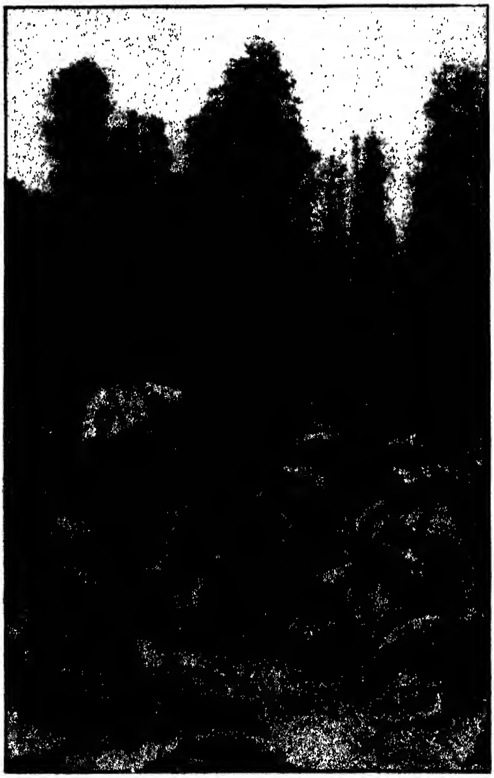


A hundred-acre Hop Plantation.

Cultivation between the vines should be thorough in order to keep the soil loose and prevent weed growth. The shoots must be trained, and in some cases tied up to the strings. Water should be put on artificially when required.

Harvesting.

Harvesting takes place in February and March, and many hands are required at this period. The stage of ripeness is indicated by the colour of the cones changing from green to yellow, and the tips closing and rustling when touched. The method of picking is to cut the vines and pick the cones into specially made bins about 6 feet by 2 ft. 6 in., and 2 feet in depth, from which receptacle they are taken in bags and weighed before putting in the drying kiln. The picking is almost always done by hand, and paid for on results, a good picker earning up to 10s. per day. An average picker will pick approximately 125 lbs. in a day. The price for 100 lbs. is 6s.



Mr. Panluk's Hop Plantation at Eurobin.

Drying.

The kilns in which the hops are dried are of varying sizes. The usual building is 20 feet square, and 16 feet to the eave. The furnaces are on the ground floor, and another floor is built from 10 to 12 feet from the ground, of battens 1 inch apart, and covered with wire gauze and hessian; on this floor, the hops are spread as taken from the field

to a depth of 1 foot deep, and turned as required with a large wooden shovel or scoop. Curing takes from eight to ten hours, at temperatures ranging from 105 degrees F. to 120 degrees F., and in some cases still higher, the object being to dry out the moisture without spoiling the colour or scorching the hops. The use of ventilators or air fans is required for this purpose. Charcoal is considered the correct fuel, but furnaces are now often made which consume wood. Care must be taken to avoid smoke passing through the hops. After drying, the hops are raked out on to floors well off the ground, generally a loft, from which they can be passed into the press.

Presses are made on the principle of the wool press, and the hops are placed in wool bales, each bale holding from 1½ to 3 cwt., when the crop is ready for market.

Prices, &c.

Prices during recent years have proved highly remunerative to growers, ranging up to 5s. per lb., giving a return of £500 per acre. These prices may not be maintained, but there is still a handsome profit to be made at lower prices. The cost of establishing a hop garden depends greatly on the facilities for obtaining poles, &c., but can be put down at from £75 to £100 per acre; and the annual attention and cost per acre, from pruning to market, at £50 per acre. The variety giving most satisfaction at present is that known as the Cluster Hop.

Conclusion.

The valley of the Ovens River, in the north-eastern portion of Victoria, is now growing the bulk of the hops produced, one plantation of Mr. Panluk, of Eurobin, consisting of 100 acres; while Mr. Gow, of Harrietville, and Mr. O'Sullivan, of Ovens Vale, also have large gardens, and are highly successful growers.

In conclusion, I would suggest that any intending grower would profit greatly by a visit to some well-established garden before laying out his own, in order to see the general conditions and practices under which present hop producers conduct their operations.

FEEDING DAIRY COWS.

By A. J. Gill, Dairy Supervisor.

In some portions of Australia, nature has apparently made provision for drought and times of scarcity by providing trees and shrubs with edible foliage on which stock may subsist. Victoria, however, has not been so favoured, and has no source on which animals may draw during times of stress.

Judging from past experiences, portions of Victoria are visited by droughts every few years, and during each visitation large numbers of valuable animals are lost, as each dry spell finds the majority of farmers, notwithstanding repeated warnings, unprepared and their farms overstocked. I have noticed throughout the State the strong tendency on the part of land-holders to keep on increasing the size of their flocks and herds without making any extra provision for them.

Some time since, I occasionally visited a farmer on a small piece of land of extra good quality, but so overstocked that the cattle were

always in low condition. I kept continually pointing out to him the difference in the yield between cows well fed and those partially starved, and advised him to reduce the size of his herd. He said he would try to rent another 6 acres. Subsequently, I visited his farm, and learned that he had been successful in obtaining the extra 6 acres; but he had also purchased six more cows. Needless to say, his herd was in the same starved condition as before.

When a drought comes, it is on the dairyman with cows in calf and in low condition that the severest strain falls. In fact, it is usual for some to be so heavily stocked as to lose one or two cows each year. If the winter be mild, they may struggle through, but with their herds in poor condition. Such cows will probably have a fair milk supply for a few months during the spring and early summer, but when the green grass disappears, the cows will dry off. During a severe winter, it is the poorest cows that are lost, and as these are naturally the heaviest milkers, the herd is culled in a most unfortunate manner. It is only when a man gives his cows sufficient feed that he can cull satisfactorily.

I know of a farm where the cows were giving about 2½ gallons per head when the owner commenced to increase their feed, and then the yield from each member increased; but one cow soon shot ahead of her mates, until she was giving 50 lbs. of milk daily. A cow yielding 200 lbs. of butter-fat on one farm may yield 450 lbs. on another where she is properly fed.

Most land-holders, of course, do not like to see any grass going to waste, but, after all, it is much better to have a little surplus grass in the paddock than to have stock dying in the winter time. Further, a little old grass will shelter the young grass from severe frosts, and secure a much better growth during the winter time.

It is exceedingly disappointing to find men who have purchased pure-bred bulls, and, in some cases, are testing their cows and keeping records, yet keeping their herd in a semi-starved condition. Testing, in these circumstances, is not of much use. If a man wishes to be successful on the land, he must feed his stock. In nineteen cases out of twenty, one can judge a man's banking account by the condition of his stock.

It must also be remembered that feeding a cow well one year will cause a natural increase the year following, by developing the udder and blood vessels. Development can never take place unless a cow is well fed.

There appears to be no reason why every dairyman in Victoria should not be able to have sufficient food always on hand for his stock. In a number of cases, by reducing his herd of cows by one-third, and giving the quantity of food formerly used to the smaller number, the farmer would find a substantial increase in his banking account at the end of the year, and, further, he would not lose two or three valuable cows every hard winter.

In all dairying parts of Victoria good fodder crops, such as lucerne, oats, millet, and maize can be grown. Though a number of farmers do grow such crops to supplement the pasture, the area is often too small to be of much use. For instance, 1½ to 2 acres of maize or millet, and a couple of acres of oats, will not go far towards feeding a herd of 40 cows. It is a wise rule to cultivate at least 1 acre for each cow.

In growing the crops, a scheme which I found to work very well was to have two cultivation paddocks, and use them for summer and winter crops alternately. A great advantage was that the ground used for maize and early potatoes was worked well through the summer, and retained a certain amount of moisture, and consequently was in good condition for early green-stuff and the oaten crops. The ground from which the grain crops had been cut was ploughed in the early winter, the moisture conserved, and an early crop of millet or maize insured. The working of the ground each year at a different time kept down weeds and helped to keep it in good condition.

In storing the crops the circular silo stands out for handiness for either ensilage or chaff. A good supply of ensilage provides succulent roughage for all seasons of the year.

When harvesting the hay crop, an effort should always be made to chaff the hay direct from the paddock into the barn or silo. This saves the expense of double handling and the purchasing of chaff bags, and prevents loss both from mice and weather.

When feeding dairy cows, in order to get the very highest value from pastures, it is necessary to supplement roughage, *i.e.,* bulk food, with concentrates, or, in other words, to balance the ration. Unfortunately, many of our dairy farmers think that the balancing of a ration is something that is altogether too difficult for them to consider or to attempt. To these the following simple hints may be of use.

The chief necessary constituents of food are protein, carbohydrates, fat, and certain mineral matters. Protein, one of the chief constituents of lean flesh, milk, skin, and hair, is the most valuable and the most difficult to obtain. In order that an animal may be given sufficient protein, grain mixtures, bran, pollard, linseed meal, &c., are used.

Carbohydrates supply the heat and energy for the body, and are supplied by sugars, starches, crude fibre. These are usually supplied in liberal quantities by the roughage given to cows, and are therefore much easier to obtain than protein. Fats are used for the same purposes as carbohydrates. Mineral matter such as potash and lime are supplied by lucerne, clovers, and other legumes, and phosphoric acid by bran. The farmer's chief concern, therefore, is to supply concentrates containing sufficient protein. To do this it is necessary to study the quality of the roughage. For instance, when the grasses are flowering and seeding, they contain a much higher percentage of protein than after they have become bleached in the sun and the seed has fallen. Thus, the quality of the pasture varies during the year. Again, the protein content of lucerne is much higher than that of maize and millet. The protein of different grains also varies; consequently, a mixture of these is more palatable, and gives the best results. As concentrates in light, bulky form, such as bran and ground oats, are the more easily digested, an endeavour should be made to have half, and never less than one-third of the mixture in this form. Bran and linseed meal have laxative effects. In order to arrive at the amount of concentrates to allow, the following may be taken as a rough guide:—

For Friesian—1 lb. of concentrates to 4½ to 5 lbs. of milk.

For Ayrshire—1 lb. of concentrates to 4 to 4½ lbs. of milk.

For Jersey—1 lb. of concentrates to 3 to 3½ lbs. of milk.

At times, breeders feed 1 lb. of concentrates daily to every 1 lb. of butter fat produced weekly.

Some cows respond better to one mixture than another. The farmer should, therefore, vary the constituents of each cow's feed and note if this has any effect on her yield. He should also observe the result of increasing the quantity of any cow's allowance.

An allowance of salt will make the food more tasty and help to keep the cow in good health. An ounce or so might be given with the morning ration and the same quantity again in the evening.

Where the cow has good pasture there is very little need for roughage in the bails—2 or 3 lbs. daily to insure slow mastication of the concentrates is sufficient.

The following is a list of 10-lb. mixtures of concentrates which have been and are being used by several of the successful breeders in the Government Herd Test. The percentage of protein in each mixture is stated.

Mixture	Protein
3 lbs. bran 3 lbs. ground oats 2 lbs. ground barley 2 lbs. polly meal	10.8 per cent. protein.
3 lbs. bran 3 lbs. branning 2 lbs. coconut oil cake 2 lbs. polly meal	12.3 per cent. protein.
3 lbs. bran 3 lbs. ground oats 3 lbs. malt combings 1 lb. Meggitt's meal	13.2 per cent. protein.
4 lbs. ground oats 4 lbs. bran 2 lbs. Meggitt's meal	13.4 per cent. protein.
4 lbs. bran 3 lbs. polly meal 2 lbs. maize oil meal 1 lb. Meggitt's meal	15 per cent protein.
4 lbs. bran 2 lbs. pollard 2 lbs. polly meal 2 lbs. linseed meal	15 per cent. protein.
4 lbs. bran 2 lbs. ground oats 2 lbs. maize oil meal 2 lbs. Meggitt's meal	15.3 per cent. protein.
5 lbs. bran 3 lbs. maize oil meal 2 lbs. Meggitt's meal	16.4 per cent. protein.
3 lbs. bran 3 lbs. polly meal 2 lbs. pea meal 2 lbs. Meggitt's meal	16.7 per cent. protein.

WORLD'S POULTRY CONGRESS.

By A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

(Continued from page 181.)

POULTRY KEEPING IN SOUTH AMERICA.

The New South American Fowl.

Professor Salvador Castello Carreras gave an interesting description of a new breed of fowl which he had discovered in Chili in 1914. The shanks and beak are either yellow or white; eyes, dark red; comb, small; tail always absent. Lays rather a small egg, of bluish colour, or blue with small brown spots.

It is more plentiful in the south of Chili than in Arancaria, but is found again towards the north, even in the latitude of the Panama Canal.

Professor S. C. Carreras has lectured on poultry keeping throughout the Argentine, Uruguay, and Chili. In Mexico exists a poultry school aided by the Federal Government, and the National Association publishes a well informed paper. Exhibitions are held, and modern poultry raising improvements are well known.

In Uruguay the Government awards scholarships to students who have studied poultry keeping in the United States, and in Europe. It also runs a model poultry farm, where 2,000 birds are reared every year, and thousands of eggs are sold at very low prices to enable the farmers to get hold of excellent strains of birds on advantageous conditions. The Government of Uruguay, in 1917-18, ran a twelve months laying test, when the average production for the competition was 185 eggs per bird.

From 400 to 500 persons attended Professor Carreras' lectures, which showed the public interest in the poultry industry.

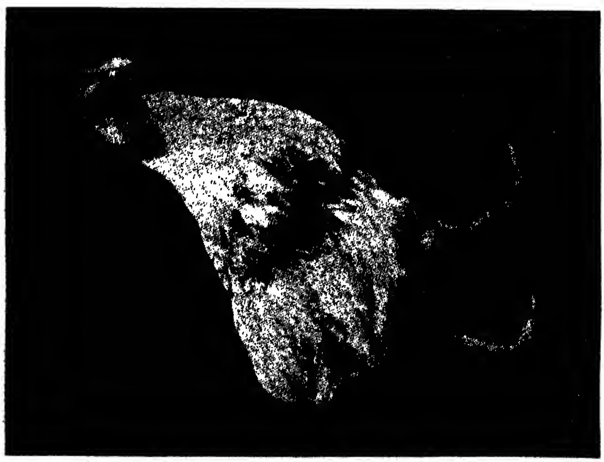
In the Argentine Republic, particularly in the province of Buenos Ayres, poultry breeding is enthusiastically undertaken. The Government has founded a poultry school in La Plata, and various lecturers travel all over the country to encourage poultry keeping.

As regards production, Mexico and Uruguay produce sufficient for home consumption, but Argentina still imports a great many which are provided by Uruguay, Chili, and even Australia.

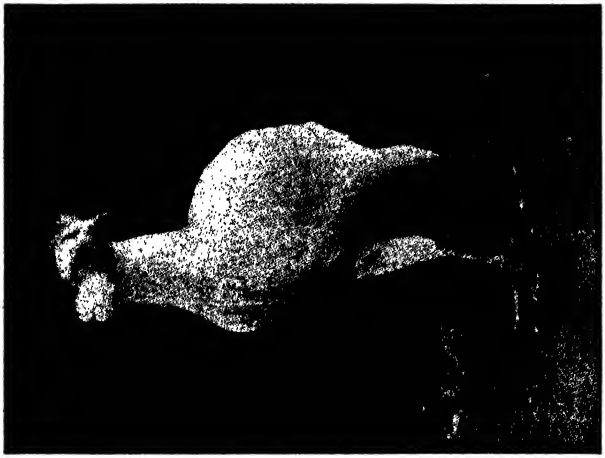
Six hundred and fourteen students, including 120 ladies, underwent a course of poultry keeping at the University of Santiago, in 1914.

Crossing the Straits of Magellan to Punta Arenas, in Patagonia, there may be found one farm carrying 12,000 birds, whose eggs are sold to the ships passing through the Straits. An American naval squadron on one occasion took 40,000 dozen eggs from this farm, all laid by the rumpless fowls.

Amongst these hens are some with two tufts of feathers, one on each side of the head, which always bears a single comb. These tufts originate in a small epidermic protuberance which, in its turn, is connected with the head by a fine thread of elastic skin, which allows the protuberances to be stretched to a certain length from the head.



Cock.



Hen.

A new South American Fowl.
(Specimens five or six months old.)

There are no feathers on the shanks. The feet, like the beak, are white or yellow; the latter colour is the more frequent. The colour of the feathers, though generally white, or white with red wings, is extremely varied. As will be seen from the illustrations (p. 240), this is undoubtedly a new type, and is now known as Gallas inauris (earrings).

Organization of Experimental and Extension Work in United States of America.

Mr. H. M. Lemon, Senior Poultry Expert, Department of Agriculture, United States of America, described the progress of the work of his department. In 1906, the first poultry bulletin was issued, and in that year the first appointment to a regular poultry position was made.

Two years later, a general survey of poultry and egg conditions was made in the middle Western States, and "rooster" days were held in many States, when whole car loads of male birds were shipped to market. [This idea might be well applied to Victoria.]

The year 1912 saw the start of the Government Poultry Farm, since which time the development has been consistent, and is now being extended more towards the research side, although the great extension bureau, known as the States Relations Service, is continuing and expanding.

Twelve bulletins have been issued specially for boys' and girls' clubs, and 22 other bulletins are available for farmers. The poultry industry is worth about 1,000,000,000 dollars a year to the United States of America, and extension and research work are considered an investment, not an expense.

About 2,000 birds are kept for experimental purposes on the Government Farm. An interesting experiment conducted on the Government Farm was the mating up of farmers' mongrel fowls, bought in the auction rooms, with pure bred male birds.

In the course of three generations, the progeny showed an average increase in weight of 2.16 lbs. per pullet, and a "Better Sires" campaign was promptly launched.

Another experiment on the value of meat meal proved that where pullets on range averaged 90 eggs per bird, their returns could be raised to 150 eggs per bird—another five dozen eggs—by the use of about sixpence worth of meat meal per bird.

Somewhere about 15,000,000 dollars worth of eggs are spoiled annually through being fertile, which is an excellent reason for the elimination of the surplus rooster.

American Methods of Lighting.

Professor H. R. Lewis, of New Jersey, gave an interesting description of artificial lighting, and the associated feeding problems, which were unknown up to twenty years ago, when Dr. E. C. Waldorf first experimented, and it was really only ten years ago when Dr. and Mrs. Shoup, at Puyallop, Washington, attempted to work on a commercial basis.

By the use of some means of artificial lighting, laying flocks are given additional hours of light in which to eat mash and grain. It is estimated that artificial illumination increases egg production by about two dozen eggs per bird, and also increases the net return per bird by two dollars a year, owing to the increased production during the winter months, when prices are high.

Six hundred unlighted pullets showed a profit of \$4.10 per bird; 500 pullets lighted 4 a.m. to dawn, \$5.77 per bird; 100 pullets, lighted for night feed, \$6.48 per bird, the cost of the current being about $4\frac{1}{2}$ cents per bird, which means that an increase of one egg pays for the current.

Experiments proved that best results were obtained on a day of fourteen hours light, and ten hours darkness. Two 25-Watt lights were used in a house 20 feet by 20 feet, but where electricity is not available, ordinary barn (or hurricane) lanterns have been used successfully, whilst gasoline, acetylene, and other methods, are at times used.

Tests showed that birds re-acted favorably to lights in from seven to ten days. The lighting is primarily a feeding problem, and really advances the season of heavy production from the spring months (when the days are lengthening) to the naturally shorter days of autumn and winter.

Equipment for Hatching and Rearing Chickens.

Mr. G. Cugley, president of the American Incubator Manufacturers Association, explained that the object of this association would be to promote, co-operate, co-ordinate, and foster the incubator manufacturing business, including brooders, supplies, equipment, and allied lines, and that all the members of the association must have the following qualifications.

First: Members must be well qualified to conduct the business in which they are engaged.

Second: Members must have sufficient capital, and facilities for the proper conduct of their business.

Third: Members must be of good moral standing, and enjoy a generally good reputation.

Fourth: Members must agree to abide by the rules and regulations governing this association.

Fifth: Members must, regardless of anything else, be actively engaged in the manufacture of incubators or brooders for at least three years.

For a long time the best known American incubators were heated by hot air systems, which mostly cooked all the moisture out of the circulating air before it entered the egg chamber, and pans of water or wet sand were used in an effort to replace that necessary moisture. The substitution of hot water radiating systems, however, developed the fact that fresh eggs would hatch satisfactorily without artificial moisture, and 90 per cent. of the machines now made in America are on this system.

The most important factor in the production of strong, healthy chicks is the maintenance of a uniform temperature from the time they leave the shell till they leave the incubator, according to Mr. Cugley, who also considers that white diarrhœa of chicks is frequently attributable to a sudden change of temperature during the first twenty-four hours after hatching.

Possibilities of Manufactured Poultry Feed.

Professor M. E. Dickson, of Michigan Agricultural College dealt with this particular subject, recommending the ready mixed mashes and mixed grains, on the grounds that the firm who did the mixing did so with some knowledge of the chemistry of foodstuffs, and took care that the rations were well balanced. Modern machinery, and dealing in large quantities would help to keep down the cost, and thereby enable

the manuafacturer to put out a mash, or scratch grain, on terms that would compare favorably with the cost entailed by the poultry farmer by mixing up his own foodstuffs.

Principles of American Culling Practice.

Dr. O. B. Kent, of Cornell University, pointed out that the characters used in culling to determine length of laying period were:—(1) Body conditions, indicating laying; (2) pigmentation; (3) moulting.

Careful measurements showed that the parts of the body vary with the laying condition. The comb increases or decreases in size according as the hen is increasing or decreasing her production. When laying uniformly or decreasing, the comb feels cold to the touch, but as her weekly number of eggs increases, the comb feels warm. With a laying fowl, comb expansion is accompanied by an expansion of the vent, which becomes loose, moist, and flabby; the abdomen also becomes soft and pliable. Comb expansion on a hen that is not laying produces a small hard, dry, tight, puckered vent, and small, hard, leathery abdomen.

Pigmentation only applies to yellow skinned varieties, which are largely kept in America. The colour fades first in the vent, then in the eyes, comb, face, and ear lobes. After that the beak fades, and lastly the shanks, the scales in front fading first, those on the heel of the shank last. When a hen stops laying, the colour returns in the same order as it went out. Maize products and green stuff assist in the retention of the yellow colour. The severity of the culling depends on the feed. If the birds were fed heavily on milk, oats, or buckwheat, and had bare ground, or no range, any bird that was at all yellow would be culled, but if the birds were running on a good grass range, and were heavily fed on maize, only the yellowest shanked birds would be removed.

The third factor, moulting, applies to all breeds alike. It has been found in America that, except in comparatively rare cases, a hen does not shed feathers and lay at the same time. Occasionally a particularly good hen may be found capable of shedding a few feathers at a time, and still keep on laying. The wing primary feathers are shed in regular order, the one next to the body first, and the outside one last. It takes approximately six weeks for each wing primary feather to grow, and they are shed out at approximately two week intervals. In America, during July and August (equivalent to January and February in Australia), it is roughly correct to multiply the number of new wing feathers by two, to obtain the length in weeks of the resting period.

The back of a good producing bird is flat and wide, holding its width to the tail. A poor layer is relatively wide at the middle of the back, and narrow at the tail. Dr. Kent stresses the fact also that the good layers generally are less "wild" than the poor layers, and do not object to being handled.

Incubation.

Mr. G. H. Lamson, junior, of Connecticut Agricultural College, detailed research work in incubation. According to Phillips, eggs kept best resting on their sides. Lillie found that eggs, kept at low temperatures, were slower in starting incubation. Dryden found that it was impossible to determine whether the egg is fertile, and that neither size nor shape of egg determine sex.

Cellars are preferred for incubators on the grounds that a more even temperature can thereby be obtained. As regards humidity, testing 10,000 eggs, there was found a fairly wide latitude, the best results being obtained with from 40 per cent. to 60 per cent. humidity. Above 70 per cent., and below 20 per cent. humidity gave poor results. Turning the eggs during incubation had been investigated by Eycléshymer, and it was considered that turning five times a day gave better results than turning twice, which is the more common practice, and is labour-saving.

The individuality of the hen effecting the vitality of the chicken embryo was also carefully dealt with. Certain hens can be found that over 90 per cent. of the eggs they have laid will hatch, whilst others lay eggs that will only give a 30 per cent. hatch. The suggestion was put forward that lethal factors have caused the death of embryos at different stages of their development, and that these factors may be transmitted to the offspring, so that eggs are laid in which embryos will develop that have litle chance of surviving the seventh, eighth, or eighteenth day of incubation. "Why chickens die in the shell" may be answered some time by the geneticist—that embryos inherit a weakness, and death is liable to come before hatching. This has been shown in the embroyology of rats, and the day can be foretold on which the embryos will die during development. Seventy-five to 80 per cent. of the chicks that die in the shell do so after the eighteenth day, which is mainly due to a lack of strength inherited from the mother. Probably it is just as well that they do not hatch, and thus transmit weakness. A careful study is recommended of pre-incubational conditions of the mothers of future chick embryos.

(To be continued.)

POULTRY FEEDING EXPERIMENT.

A. V. D. Rintoul, N.D.D., Chief Poultry Expert.
W. C. Rugg, Poultry Foreman, Werribee Research Farm.

The following feeding experiment was conducted at the Werribee Research Farm, starting on 1st April, 1921, and concluding on 31st March, 1922. One hundred and twenty pullets were divided into four pens of thirty birds each, as nearly equal in quality, age, and weight as possible. None of the best matings were included, as these were required for either single test pens, or *bonâ fide* settlers.

All four groups were fed wet mash in the morning, and green stuff at mid-day, but each group was fed differently as regards the grain at night, the object of the experiment being *to test the economic importance of the various cereals used on flocks of comparatively moderate quality pullets such as would be found on any average farm*, and not to establish high records from specially selected birds.

Pen No. 1 was fed Algerian oats (not clipped).
Pen No. 2 was fed wheat.
Pen No. 3 was fed barley.
Pen No. 4 was fed mixed grains (2 wheat, 1 oats, 1 barley).

The wet mash was made up of equal parts by measure—bran, pollard, and green stuff. The bran was moistened with soup made from boiled table scraps, sheep's heads, livers, &c., or else meat meal, and dried off with pollard to a nice crumbly condition when the green stuff was added

During the months of April, May, and June no bran was available, so ground wheat and ground barley in equal quantities were used in place of bran in the morning mash.

The green stuff used was lucerne, green barley, rye grass, and outer leaves of vegetables cut fresh and put through the chaff-cutter.

Minced raw onions were fed once a week at the rate of 1½ lbs. per 100 birds. Epsom salts and sulphur were used occasionally.

Housing.

The birds were housed in a corrugated iron shed, divided into four pens, each containing about 160 square feet of floor space, being slightly over 5 square feet of floor space per bird.

The floor was kept covered with litter 4 to 6 inches deep, and no outside run was made available.

A dust bath was provided, whilst shell grit and charcoal were always available. Dropping boards were provided underneath the perches.

Health.

Unfortunately the mortality was high, as 10 died in No. 1 pen, 8 in No. 2 pen, 9 in No. 3 pen, and 6 in No. 4 pen. Sixteen of these died from unknown causes; *post mortems* were held on the farm and one bird was sent to the Veterinary Research Institute, without definite results, although it is more than likely that—indirectly—rats were the cause, by contaminating the drinking water. Early in December a raid was made, and 182 rats were thereby killed. After that no deaths occurred. Heat caused the death of 6 birds on 18th November, 3 were crop-bound, 6 died from ovary troubles, and 2 from accidents.

EGG PRODUCTION.

Month.	No. of birds.	Pen No. 1.	No. of birds.	Pen No. 2.	No. of birds.	Pen No. 3.	No. of birds.	Pen No. 4.	Price of eggs.
									s. d.
April ..	30	199	30	238	30	281	30	260	2 9
May ..	28	222	27	221	27	194	29	187	2 10
June ..	25	343	27	279	25	284	29	230	2 6
July ..	25	396	25	368	24	259	28	363	1 11
August ..	25	478	25	468	24	362	28	464	1 6
September	25	535	23	476	23	410	28	512	1 1
October ..	21	450	23	412	23	425	28	557	1 1
November..	20	254	22	351	21	310	25	398	1 3
December ..	20	333	22	302	21	273	25	336	1 6
January ..	20	327	22	265	21	224	24	376	1 6
February ..	20	228	22	227	21	203	24	308	1 8
March ..	20	188	22	224	21	155	24	235	1 11
		3,953		3,831		3,380		4,226	

ANALYSIS OF FOODSTUFFS USED IN POULTRY FEEDING EXPERIMENTS AT THE RESEARCH FARM, WERRIBEE.

Samples on analysis were found to contain—

—	Barley.	Oats.	Wheat.	Ground wheat and barley.	Mixed. Two of wheat; one of oats; one of barley.	Bran.	Pollard.
	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Moisture	11·91	8·89	10·55	10·85	10·11	10·46	10·31
Ash	3·01	3·61	2·81	2·89	2·36	4·82	2·36
Protein	8·25	9·25	10·69	9·38	9·79	13·81	12·06
Fibre	5·39	8·97	2·72	4·11	5·38	8·91	5.08
Nitrogen free extract	69·55	61·84	71·18	70·79	69·03	58·71	66·25
Ether extract ..	1·89	7·44	2·05	1·98	3·33	3·29	3·64

Summary.

EGG YIELD AND FEED COST.

—	Average eggs per bird.	Average price per dozen eggs.	Return per bird.	Cost of Feed.			Profit over feed.
				Mash.	Grain.	Total.	
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Pen 1 (Oats) ..	170	1 8	23 7⅓	3 1¾	3 9¼	= 6 11	16 8
Pen 2 (Wheat)	150½	1 8	20 10⅚	2 8¾	6 7⅔	= 9 4⅔	11 6⅖
Pen 3 (Barley)..	144⅓	1 8⅔	20 9⅔	2 7½	3 3⅓	= 5 10⅘	14 10⅘
Pen 4 (Mixed) ..	157½	1 7⅓	21 1⅔	2 5⅞	4 6¼	= 7 0⅛	14 1½

It will be seen from above that the Algerian oat fed pen showed the best score, as well as the greatest profit per bird.

Weights of Birds.

At the commencement of the test the pullets averaged 2 lbs. 12 ozs. each.

At the conclusion of the test the No. 1 pen averaged 3 lbs. 4 4-5 ozs. each; No. 2 pen, 3 lbs. 9¾ ozs. each; No. 3 pen, 3 lbs. 10 ozs. each; No. 4 pen, 3 lbs. 8⅔ ozs. each.

The oat fed pen showed the least gain in weight, and the others were more or less equal, with a fractional margin of increase in favour of the barley pen.

Food Prices.

Wheat, 60 lbs. bushel—1st April to 31st January, 9s. per bushel; 1st February to 31st March, 5s. per bushel.

Oats, 40 lbs. bushel—All the year, 3s. per bushel.

Barley, 50 lbs. bushel—1st April to 31st December, 3s. 6d. per bushel; 1st January to 31st March, 3s. 3d. per bushel.

Bran and pollard—£6 10s. per ton throughout the year.

Crushed wheat, 60 lbs. bushel—April, May, and June, 9s. 4d. per bushel.

Crushed barley, 50 lbs. bushel—April, May, and June, 3s. 10d. per bushel.

No charge was made for greenstuff, or meat scraps.

Conclusions to be Drawn.

It may reasonably be concluded that Algerian oats are a thoroughly satisfactory feed, and should be more generally used than is the case at present. As was anticipated, barley gave the poorest egg yield, but the birds so fed laid well at the time of the year when eggs were dearest. Barley might, therefore, be fed with advantage during the winter months.

HOW TO GROW NATIVE PLANTS.

It is a mistake to think that our native plants do not like rich soil. They do, but, with very few exceptions, they dislike raw and fresh manure. What the majority of our bush plants do not like is root interference. They should be grown in a place to themselves, not in the mixed borders where once a year at least other plants are being dealt with and the soil renovated. They should be allowed to grow thickly so that there is no room for anything, no room to dig, even if you wanted to. There is no reason why the bright Lambertiana should not cuddle itself under and round the stem of a bottle-brush, and if a Jacksonia should poke itself out of the top of the same bottle-brush, no harm is done; they love to snuggle up to each other. When you have grown your first line of defence, or a base for others to jump off from, there is a wide range of possibilities. In fact, so much at home could you make your native plants in your native plant garden, that not only the bright flowering gums from Western Australia, but many of our native ferns could be made to grow.

Successful and permanent development is best attained by seedlings grown by yourself. Transplanting from the bush has its merits, but they are limited. Much can be done by purchase, but there is not the same pleasure in growing a plant some one else has raised as the one you can claim as your own.—*Agric. Gazette* of New South Wales, Feb., 1922, p. 140.

RUGGING DAIRY COWS.

By R. T. McKenzie, Senior Dairy Supervisor.

The provision of suitable rugs for cows during the colder months should not be left till winter has actually come. Although the practice of rugging is growing, it is not as wide-spread as it should be, notwithstanding that those farmers who do adopt it are unanimous in their testimony of its value.

It would be more general if all dairy farmers were quite clear why in the animal economy a fall in temperature means a diminution in the flow of milk. An elementary outline of the factors causing this will enable them to better understand the reason.

All animals may be regarded as machines carefully constructed for doing work, not unlike a locomotive steam engine, which is warm, and moves along because the heat from the burning coal turns the water in the boiler into steam, which in turn moves the piston that sets the whole mechanism in motion. We know that if an engine is to do certain work, or travel so many miles, it has to be stoked continuously with coal or other fuel, but when the fuel gives out the engine becomes cool, and comes to a stand-still. The body of a cow is like that engine, only more highly organized and complex, and fed with food instead of coal. She is warm, and moves about because a fire is continually burning in her body, and that fire, like the furnace of the locomotive, must be replenished from time to time. It is therefore food being burned, or oxidized, within the animal organism which enables her to keep warm, move about, and carry on the production of milk.

These results are accomplished through the digestive process. For all practical purposes the nutritive elements of food can be divided into two classes—(*a*) nitrogenous, which include the proteids and albuminoids; (*b*) non-nitrogenous, which include the carbohydrates and fats. The nitrogenous are called flesh-formers, and the non-nitrogenous energy or heat producers.

The essential function of the flesh-formers is to build up and maintain the tissues, muscles, skin, and various organs, although, if there be an excess of such constituents in the food, it may be stored up in the body in the shape of fat, and may be used in the production of heat and energy, should the necessity arise. The heat and energy producing elements which, as previously mentioned, include the carbohydrates (starches and sugars) and natural fats, produce, through their oxidization in the system, the necessary heat for maintaining the body temperature and provide energy. They also may be stored up in reserves, as fat, or "condition," and can be drawn on at need for warmth or heating purposes. The regulation of this heat generated in the body by the burning food is automatically controlled by the sensitive nerves throughout the skin, which control the sweat glands and pores. It will be noticed in a healthy animal that the normal temperature (101.7) varies only to an infinitesimal degree on the hottest or coldest day. It is obvious, therefore, that if the body heat is dependent upon the food consumed, and that the amount of food required is governed largely by the amount of heat or energy used by the system, anything that will mitigate the loss of heat, or prevent the appropriation of the stored-up fat for heating purposes, must reduce

the fodder bill. If the cows are left unprotected from the cold during the bleak winter weather food, which would otherwise go to produce milk, or store up surplus condition, is burned for fuel, for it must always be remembered that it is only after the immediate needs of the body is satisfied that any surplus can be utilized for storing up surplus flesh or the production of milk. There are many expedients at the disposal of the dairy famer to prevent the loss of heat and condition, and consequent reduction in the milk yield.

Housing, which is so universal in European countries, is not favoured in our congenial latitude. The size of the herds, and labour involved, also prevent it. The planting of trees and wind-breaks in well-selected places would be a great protection from the cold biting winds, so much felt by dairy herds in exposed paddocks.

Rugging, however, seems the most popular form of protection. If done intelligently it will be found very efficacious. The initial outlay is small, and will probably prevent the loss of much money, and, perhaps, the death of cows from exposure. A couple of sound sacks sewn together make a very good rug, and soon becomes waterproof through the natural exudate from the skin.

The practice sometimes followed of never removing the rug, even during the warmer hours of the day, must be condemned, for the animal, under such conditions, derives very little benefit. The hair will become fine, and the natural resistance to cold exercised by the skin nerves become vitiated, and fail to prevent the leakage of animal heat. The cow's skin also becomes itchy, and irritation sets up. The irritated animal will be found continually rubbing herself, and the rug soon becomes dilapidated.

The rugs should, therefore, be removed in the day-time when the shade temperature reaches 60 degrees. The cow can then keep herself clean by licking, the hair will be given an opportunity of thickening out, and for a few hours, at any rate, the rug can be hung on a fence to dry and air.

IN the effort to give more relief to cattle raisers throughout the Territory the Hawaiian Board of Agriculture and Forestry is now considering the proposition of introducing from Australia a bird which will destroy the adult fly.

The bird which has been highly recommended is a fly catcher called the Shepherd's Companion (*Rhipidura tricolor*). It is also known in Australia as Willie Wagtail, because it spreads its tail out fan-like and wags it from side to side. The bird has a wide range of distribution from Australia through the Malay Islands to the mainland of Asia.

The Willie Wagtail is considered to be wholly insectivorous and for this reason there is no danger of its becoming a menace to rice or other agricultural crops in these islands. In its native habitat it is very seldom found in the thick forest country or in the middle of cane fields, but is often found around the edges by the roadside especially if horses and cattle are about. There is little doubt that it would be of benefit in these islands for it feeds on flies of various sorts, grasshoppers and nearly any insect that is moving about. For this reason, it would also take beneficial insects as well as harmful ones, but the few beneficial flies that it would capture would be offset by the leafhoppers, moths and other cane enemies which it would consume, thereby squaring accounts.

METEOROLOGICAL OBSERVATIONS.

STATE RESEARCH FARM, WERRIBEE.

Summary of observations made during 1921, and comparison with averages for previous years :—

RAINFALL.

Average annual rainfall for forty-two years prior to 1913 ..	=	20·19 inches.
Average annual rainfall for period 1913 to 1920 (8 years) ..	=	19·55 „
Rainfall during 1921 (3 inches in January)	=	20·45 „

BRIGHT SUNLIGHT.

Average annual total during 7-year period 1914 to 1920	=	1,851·8 hours	=	Daily Mean, 5·0 hours.
Total during 1921 ..	=	2,217·6 „	=	Daily Mean, 6·0 „

EVAPORATION.

Average annual total from free water surface during 7-year period 1914 to 1920	=	46·641 inches.
Total during 1921	=	44·802 „

MEAN AIR TEMPERATURES.

Period.	Dry Bulb.	Wet Bulb.	Maximum.	Minimum.	Mean of Max. and Min.
Average for 7 years, 1914 to 1920	58·1° F.	53·9° F.	67·2° F.	48·3° F.	57·7° F.
During 1921 ..	59·5° F.	54·8° F.	68·3° F.	48·8° F.	58·5° F.

MEAN SOIL TEMPERATURES.

Period.	At 1 Inch.		At 6 Inches.		At 12 Inches.		At 24 Inches.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
Av'ge for 7 years, 1914 to 1920	69·5° F.	51·7° F.	62·0° F.	54·1° F.	60·0° F.	55·6° F.	59·1° F.	56·9° F.
During 1921	64·6° F.	52·2° F.	63·9° F.	56·2° F.	61·5° F.	57·2° F.	60·4° F.	58·1° F.

MEAN OF MAXIMUM AND MINIMUM SOIL TEMPERATURES.

Period.	At 1 Inch.	At 6 Inches.	At 12 Inches.	At 24 Inches.
Average for 7 years, 1914 to 1920	60·7° F.	58·0° F.	57·8° F.	58·0° F.
During 1921	58·4° F.	60·0° F.	59·3° F.	59·2° F.

EARLY MATURING PIGS.

How Quickly Large Whites put on Flesh.

An impression, a correspondent writes, has been created, and perhaps still exists, that Large White Pigs mature slowly. This doubt has been completely dispelled by many practical tests carried out by breeders, feeders and experimentalists. In this connexion it is instructive to learn the evidence of Mr. George R. Rommell in a bulletin issued some time ago by the United States Department of Agriculture, Bureau of Animal Industry. He states:—

"These experiments, taken in connexion with the evidence of investigators over the entire country, undoubtedly show that representative pigs of the different breeds do not materially differ either in the rate of gain or the economy with which the gains are made. Any marked difference in the breeds will be manifested in the suitability of the fattened animals for market, and the quality of the carcass on the block. A very notable feature is the showing of bacon breeds when compared with the lard breeds. The fact that a pig is a Large White or a Tamworth cannot be taken as *primâ facie* evidence that it will make slow and expensive gains."

In view of these remarks it is interesting to learn that three Large White Boars (barrow pigs) from the herd of Mr. A. W. Coultrip, Norwood Manor, Eastchurch, Sheerness—an enthusiastic supporter of this breed in Kent—which were recently killed at 15 weeks old, attained the following weights:—108 lbs., 103 lbs., and 86 lbs.

The pigs were weaned at eight weeks old and thereafter fed three times a day on damaged Quaker oats, barley meal, and a little fish meal, the meal being fed warm. This surely proves the value of Large Whites for early maturity.—*The Farming News, Scotland.*

THE SOWING OF WATTLE SEEDS.

Green, silver, and black wattles are almost invariably sown *in situ, i.e.,* directly on the ground where they are to stand permanently.

The best time for sowing varies with different localities. In places where frosts are severe, sowings made in February to April seem to answer best. The young wattles, by the time the cold weather arrives, are well rooted but still lie flat on the ground. In this position they stand cold much better than when they have thrown up an erect shoot, and consequently they are in a condition to start vigorous growth first thing in spring. By the following winter, in localities suited for their culture, they should be well enough established to endure its rigours

unharmed. At lower elevations where frosts need not be feared, sowing should be done with the first heavy rains in summer.

The seed may be either sown in lines or broadcasted. The former method is preferable except on clean, newly broken up land, as cleaning and cultivation of the crop are greatly facilitated. A good espacement between the lines is 6 feet. For broadcast sowing about 16 lbs. of seed is needed per acre, according to the size of the seed, while in line sowing 2 to 3 lbs. is enough.

Before sowing, wattle seed should be specially treated to soften hard seed coat, otherwise the seeds may lie in the ground without sprouting for a very long time, and thus an uneven germination will result. The treatment consists in pouring boiling water on the seeds and letting them remain in it for twelve to twenty-four hours, or even longer, but, at any rate, long enough to soften the seeds sufficiently to allow of them being cut with the finger nail.

Once the seeds have reached this condition they should be sown without delay. It will be found that after the soaking process they clot together, and that there is then difficulty in sowing them evenly. This difficulty may be overcome by washing them in clean water to remove the mucilage, or by mixing them with enough fine dry sand to absorb it. Land intended for the cultivation of wattles should be broken up the summer or autumn previous to sowing, and should be worked up in the same manner as if a crop of maize or oats were to be grown on it.

For a couple of seasons, till the wattles are thoroughly established, they should be kept clear of grass and weeds.—Reprinted, with slight alterations, from *Journal of the Department of Agriculture, Union of South Africa.*

SOUTH AFRICAN AND AUSTRALIAN WINES.

An interesting section of the Annual Brewers' Exhibition held in London, is the Colonial Wine Competition, where South African and Australia wines are exhibited and judged. The 1919 competition resulted in Australia annexing all the first prizes, while South African wines secured only one second and four third prizes. The following year's competition saw a reversal in favour of South African wines, which obtained in the fourteen classes as many as eleven first, five second, and two third prizes, being beaten by Australia in two classes only. The result of the 1921 competition has just come to hand and shows a more even distribution of prizes. There were again fourteen classes of wines. South Africa secured five firsts, eight seconds, and six thirds, against Australia's nine firsts, four seconds, and three thirds. The latter country's produce was successful, therefore, in obtaining

more of the first prizes awarded than South Africa, but in the aggregate number of awards South Africa was first.

The competition produced some interesting specimens, and the judges in making their awards found wines that should compete favorably with Continental growths. They give the opinion that the competition is of practical benefit to the trade and proves that South Africa and Australia are capable of producing wines that can compare very favorably in quality and style with those of other countries. But the most important consideration is the cost of production, which must be at a price that will create a ready demand. The judges give it as their opinion also, on the wines as exhibited, that those most likely to be popular in Great Britain would be of the full Claret or Burgundy type.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

As soon as the fruit is off the trees, the land should be well ploughed and left in a rough condition until the spring ploughing. If not already done, and the orchard conditions demand it, there is still time to put in a leguminous crop for green manuring purposes. But this should be done as early as possible, so as to give the crop a chance to make some good early growth. Soils deficient in lime or in organic matter are always benefited by a crop of green manures. Where stable manure is unprocurable, the green manure crop is the only means of adding organic matter to the soil.

PESTS AND DISEASES.

All second-hand and old cases should be thoroughly overhauled. It is preferable to do this work now, instead of leaving it till spring, when the rush of other duties will certainly prevent it being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis, and also any spores of fungus diseases that may have found lodgment therein.

As soon as the trees have shed their foliage they may be sprayed with red oil emulsion for woolly aphis, peach aphis, and the bryobia mite. And this should be done before pruning, so that in handling and carrying the prunings the pests will not be spread about the orchard to infect the clean portions.

The Flower Garden.

Bulbs, tubers, and corms of spring-flowering plants should now all be planted. As they appear above ground, they should be protected from the ravages of snails and slugs, as these pests have a very great

liking for these succulent growths. A good surface dressing of broken leaf or dust tobacco will effectually deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust forms, will very soon be in the happy position that slugs and snails will cause him no anxiety whatever. Besides, the tobacco has manurial properties which are also valuable.

Pansy and any other seedlings, also rooted layers and cuttings, may now be planted out into their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinum, aquilegia, correopsis, Canterbury bell, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

The Vegetable Garden.

There should now be no untidy or undug beds in the kitchen garden. The vacant beds should all be well dug over and prepared for the planting of vegetables for use in spring. In digging, a top dressing of manure should be given; this may be dug in. All weeds, too, may be forked into the trenches, and covered well with soil as each spit or length is dug. A dressing of lime is very beneficial at this time of the year three or four weeks after the manure or weed dressing.

A start should now be made at cleaning out the asparagus beds. This vegetable is most popular, and yet one rarely met with in ordinary household gardens. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed plots in the whole garden. Depth of good soil and plenty of manure are all that this plant requires.

In establishing a new bed, it is advisable to see that there is a good depth of 2 or 3 feet of rich, well-manured soil. If this is not present, the soil should be dug out to that depth, and thoroughly mixed and enriched with well-rotted manure before being replaced. A bed deeply prepared, and supplied with ample quantities of manure, should last without replanting for very many years. The young plants or crowns should then be planted in trenches, keeping the rows 2 or 3 feet apart. An asparagus bed requires ample and direct exposure to the full rays of the sun. The asparagus should not be cut during the first season after planting; in fact, it is better to allow it to go uncut for two seasons. As little foreign weed growth as possible should be allowed in the beds, but, when they are not producing culinary asparagus, rows of lettuce, beans, radish, &c., may be grown between the crowns.

Towards the end of April the tops may be cut down, the beds cleaned, and a good top dressing of stable manure given. Chemical fertilizers, such as bonedust, sulphate of ammonia, and sulphate of potash, may be given as a substitute to organic manure. In the past it has been the custom to annually top-dress the beds with salt. It was supposed that, as asparagus in its native habitat was usually found in sandy soils near the sea coast, the plant required salt or a saline soil to produce successful results. It has latterly been found that salt is not at all essential to

good growth, and that the plant will readily adapt itself and grow well in soils of not at all a saline character. Where potash has taken the place of salt, quite improved results followed.

Seeds of onion, turnip, cabbage, cauliflower, carrot, and parsnip may now be sown.

REMINDERS FOR MAY.

LIVE STOCK.

Horses.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Attend to teeth and feet of horses to be turned out for the winter.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm dry shed. Observe strict cleanliness in feeding to avoid losses and sickness incidental to calf-rearing.

Pigs.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as pork is very dear. Rape, barley (especially skinlesss), oats, &c., may be sown for grazing during winter. Crushed oats will be the most economical feed for pigs at present prices.

Sheep.—Keep in-lamb ewes in strong condition. Best lambing results are obtained when ewes are neither too poor, nor excessively fat. Once the lambs arrive then the most liberal treatment possible is in the main the most profitable. Ill-fed ewes are bad mothers, indifferent to the new-born lamb, and rearing them badly afterwards, particularly very young or very old ewes. Select fine weather for lamb-marking. Yard lambs over night. Never castrate or tail high-conditioned lambs immediately on being run in and overheated. The risk with large lambs will be lessened if they are allowed to stay in the yards an hour or two after castration and the coagulated blood drawn, which in many cases will be found retained in the groin and purse, no matter what method of opening the purse is used. In tailing never draw tails tight. Projecting bone delays healing, especially when cutting off with hot blades. Even with the knife leave enough loose skin to come over and cover the vein and check the usual strong rush of blood from lambs on well-fed mothers.

Poultry.—Feed animal food to forward pullets, about ¼ oz. daily, and equal parts heavy oats and broken maize at night. Add lucerne chaff to mash daily. See that fowl houses are free from draughts to avoid colds, also that they are free from red mites. Use Epsom salts freely to avoid Roup and Chicken Pox.

CULTIVATION.

Farm.—Dig main crop potatoes. Push on with ploughing and sowing of cereal crops, including peas and beans. Green fodder (as for April) may still be sown. Land for maize, potatoes, and other root crops should be prepared and manured. Flax may be sown. Transplant Chou Moellier and Giant Drumhead cabbage plants in rows 3 feet apart. Complete sowing permanent pastures with grasses and clovers.

Vineyard.—Subsoil land for new plantations if not already done. This work should be carried out as long before planting as practicable. Vine-growers are warned against the too common practice of feeding off foliage after vintage. Any small advantage in the form of stock feed is only gained at the cost of a reduction in the following season's crop, owing to interference with accumulation of reserves, which continues so long as the leaves remain green. Sheep should not be allowed into the vineyard until all leaves have changed colour. Early and deep ploughing is strongly recommended. Manures should be applied as early as possible. Peas, &c., for green manuring, should be sown without delay, in order to take advantage of early rains.

Cellars.—Rack or fill up (preferably the former) dry wines as soon as a lighted match, introduced at bung hole, is no longer extinguished. Sweet wines should also be racked and fortified to full strength.

Orchard.—Plough, manure; apply lime to orchard lands at rate or 5 or 10 cwt. per acre where soil is sour. Spray trees infested with scale insects, Woolly Aphis, and Bryobia Mite with red oil or crude petroleum. Clean all rough bark from trees. Commence pruning early varieties at end of month.

Flower Garden.—Digging, manuring, and pruning; trench and drain where necessary. Dress the surface with lime. Continue to sow hardy annuals. Bury all leaves, soft-wood cuttings, and weeds. Continue to plant spring blooming perennials and other plants. Plant cuttings of carnations and roses.

Vegetable Garden.—Cut down and clean out asparagus beds. Apply manure and lime dressings. Cultivate deeply. Plant out seedlings and early potatoes; sow peas, broad beans, carrots, and parsnips.

BEE-KEEPING.

Reminders for May.

May is the last month during which bees may be examined, handled, and, if necessary, fed without risk of endangering the existence of the colonies or seriously interfering with their safe wintering. Supers (upper stories) should be removed and stored indoors in a dry place, care being taken that bee moths cannot get access to the combs. Where suitable storage room is not available indoors, the boxes of spare combs may be left outside, but should be placed underneath the box containing the cluster of bees and the entrance to the hive contracted to one-third or fourth of the summer width.

Small colonies should be reduced to one set of combs on a single story, and any combs not covered by bees are best removed if the amount of stores is insufficient and has to be supplemented by feeding sugar syrup. The amount of honey or sugar syrup necessary to carry bees safely through the winter varies according to the strength of the colony, the locality, and the earlier or later flowering of the spring flora of the district. It is therefore not possible to state what the amount should be; it may, however, be laid down as a general rule that the combs which the bees cover at this time of the year should be at least more than half-full of scaled honey or sugar syrup. When sugar syrup has to be fed to supplement the stores it should be given inside the hive, and should be of the density of ripe honey, or approximately two (by weight) to one of water. The simplest way of making syrup is to pour the measured quantity of dry sugar into the correct amount of boiling water, keeping it on the stove and stirring it till dissolved. The syrup should be given blood warm in a simplicity or frame feeder.

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STOCK BREEDING.*

HINTS TO BEGINNERS.

By J. S. McFadzean, Senior Dairy Supervisor.

Value of Pure Breeding.

To increase the productiveness of the farm should be the principal aim of every man on the land. Nearly every farmer is a raiser of stock of some variety; and stock and stock products constitute a very large proportion of agricultural production. Higher-priced land, higher rates of interest, higher cost of living, and higher-priced labour make it most essential that everything possible must be done to increase the acre production, in order to show a profit on the work of the farm. Well-bred stock cost no more to feed and care for than inferior animals, but they bring in much more money. Well-bred sheep cut more wool and make better mutton than those of mixed breeding. A herd of pure-bred cattle will bring in better returns than cross-breds, whether for beef or dairy produce. In fact, for every utility a more even quality and more remunerative class of stock is obtainable by pure breeding than by crossing. If none but pure-bred sires were used in every line of stock-breeding, the acre production of every farm would be greatly increased; therefore, all matings made should be on the line of preserving purity of blood rather than cross-breeding.

Breed Spoiling.

Every farmer has not the ambition to become a breeder of stud stock. Very few indeed have that natural aptitude for the work which is essential to success; but this is no reason why those who are not stud breeders should persistently spoil the work of those who are. Australia possesses some of the most able stock-breeders in the world, who have done much to improve the breeds they are working with;

* Paper read at the Annual Convention of the Chamber of Agriculture, held at Horsham, 6th April, 1922.

but they are unfortunately surrounded by thousands of other stock-raisers who, by crossing and mixing up of both strains and breeds, are keeping the general quality of farm animals down to a very low level.

An Unwarranted Prejudice.

Carelessness, want of thought, and want of knowledge all contribute to this unfortunate condition in agriculture; but an unaccountable prejudice against close breeding is responsible for the great amount of cross-breeding that is done. That such prejudice is able to exist is due to the fact that many people will accept the questionable statements of others rather than the definite evidence by which they are surrounded. The plain fact is that all good quality which is present in domestic stock has been fixed there by close breeding, and all deterioration has resulted from indiscriminate crossing. There has, however, of late years, been a gradual change in regard to this subject in the minds of stock raisers. The advantages of higher grade animals are becoming more widely recognised each year, and more pure sires are being used. The younger generation of farmers include a larger percentage of breeders of pure stock than were to be found thirty years ago; but the prejudice against close breeding is still sufficiently strong and widespread to seriously interfere with progress; and, until that is changed, advancement in stock raising will not be general.

Blood Relationship Essential.

The hackneyed phrase, "Like produces like," is used by almost every one who endeavours to explain the laws of breeding; and is intended to convey the idea that the parent stock must have characteristics in common, if similar features are to be reproduced in the progeny. But most of those who use the term overlook the fact that a likeness such as is essential to this reproduction does not often exist between a male and female unless they are related in some way. A true likeness usually indicates blood relationship. In very rare instances would the direct offspring be found to reproduce features which the parents had in common, unless blood relationship existed between them.

Close Breeding in Nature.

Those who declaim against close breeding base their whole opposition to it on the grounds that it leads to constitutional weakness; yet all round us in nature close breeding is the rule, and has been the rule for all time. Every variety and sub-variety of animal, bird, reptile, or insect breeds close, otherwise they would not exist in varieties as we find them. Cross-breeding is not followed in nature; and no line of study on any species of stock can be carried on without accepting the fact that it owes its existence solely to close mating.

An Historical Example.

The earliest records of stock breeding furnish evidence that this was recognised when our present breeds of domestic cattle were being perfected. The history of the British Shorthorn shows that the perfection of that breed in the year 1810 was the bull "Comet." This bull resulted from the successive matings of first the bull "Bolingbroke" with the cow "Phœnix," which were both sired by "Foljambe"; then their son "Favourite" was mated back to his dam "Phœnix," and the heifer "Young Phœnix" resulted; and "Comet" was a calf from

"Young Phœnix" by her own sire "Favourite." This bull was sold for 1,000 guineas, and is one of the foundation stock of the present-day Shorthorn. That this was not haphazard mating is seen from the mention that the Collings Brothers, who bred "Comet" and many other high class Shorthorns, learned their business from the older breeder, Robert Bakewell, whose name is honoured as one of the founders of both Shorthorn cattle and British long-wool sheep. But it should not require any modern evidence to convince one who gives this subject serious thought that it would be impossible for any breed of animal to have been perfected without close breeding; and it follows that what will make a breed cannot be considered as tending to destroy it. Further, we come at once back to the fact that all cross-breeding which has been carried out by thousands of stock raisers since the time of Collings Brothers has produced nothing but inferior stock.

Scrutiny of the pedigree of the present day thorough-bred horse also brings overwhelming evidence of the success of close breeding; for in speed and stamina these stock give no suggestion of deterioration. Pedigrees of pure-bred sheep and dairy cattle also show that perfection in the flocks and herds of to-day has been maintained by close breeding —the whole of the evidence on this subject being strong in support of preserving a close blood relationship, and against cross-breeding.

Grading Up.

This brings us back to where mention was made of the widespread loss which has resulted from cross-breeding. Bulls of unknown breeding —the outcome of repeated indiscriminate crosses of various breeds—are being used by many people who raise stock; and the progeny are invariably a grade worse than the parents. Where pure-bred sires are used the progeny shows improvement. Where pure-bred sires of one strain only are used successively the improvement is still more marked. Still further progress is made where there is rigid selection of the females for each year's matings; and when such selection is followed by the breeding of an improved sire back to his own progeny the offspring more quickly shows the desired quality.

Constitutional Fitness.

The one thing which has to be borne in mind is that close breeding is not a system in itself. In nature close breeding is always accompanied by natural selection of the parent stock on the basis of stamina. Such selection is made as the result of fighting amongst the males at the mating season; and through all weakly animals succumbing to the stress of seasons, or the attacks of other animals or reptiles which are natural enemies of their species. Nature allows for selection by strength of constitution; and selection must be fully as rigid in all stock-breeding work by man. A weakling or faulty animal must not be used, or the weakness or fault will be intensified in the progeny by close breeding, just as strength and soundness is similarly reproduced. Close breeding to be fully satisfactory must always be accompanied by judicious selection on soundness of constitution.

Aptitude for the Work.

No study of systems of breeding will, however, make into successful stud breeders those who have not the natural aptitude for the work.

Unless the farmer is fortunate enough to be born with the faculty of discriminating closely in regard to excellence in high-class animals, he will be well advised not to attempt special stud breeding; but to content himself by working under the advice of some one whose ability as a breeder has been proved, and who will direct as to both culling and mating. Many people who are not capable of doing this work themselves are most diffident in acknowledging it, and they lose money in consequence. Natural aptitude combined with early training and experience qualifies for this work of stock selection, just as experts are made in any other profession; and those less fortunate should not hesitate to purchase their advice exactly as they would on a subject of law or medicine. The successful stock-breeder is the one most competent to be the adviser of others: and the latter would profit most by the arrangement.

Standard Type the Basis.

In all matings the basis of selection should be on standard show type. Every breed which has any claim to popularity has been developed for utility purposes, and, in the breeding of these, symmetry and beauty of outline as well as soundness of constitution have been attained. The result, as shown in the high-class animals of each breed, is thus the work of several generations of breeders, each following up and improving where possible on the work of those preceding; and all stock raisers should aim at maintaining those lines of excellence. In the perfection of symmetry of outline there has been no loss of utility quality; but rather there has been definite gain almost everywhere. More even production (and on a higher grade) is now obtainable from pure-bred stock than at any former period, and no better reason is required for the maintenance of standard type.

Exclusive Strain.

One thing, however, must be borne in mind by all those who raise stock, and this is that many strains of breeds are almost as distinct from others as though they were separate breeds; and, therefore, the crossing of these may give very unsatisfactory results. Where a strain of any breed has been established over a number of years a blood relationship will exist amongst the stock which may not blend well with that of another strain which has kept equally distant throughout its several generations. For this reason it is advisable that the purchase of sires be made on one line of breeding; so that, by continuing the line established by the stud breeder, the farmer or grazier may participate in whatever good results the breeder obtains.

How Best to Work.

In conclusion, pure blood lines make for perfection in stock. The repeated mating of pure sires to cross-bred or grade stock will most quickly improve the quality of these latter when the sires used in succession are related. The mating of a selected sire to selected females of his own progeny is more certain to be beneficial than otherwise. The mixing of breeds is a destructive policy; while the crossing of strains should only be attempted under the guidance of expert advice. Increased acre production from stock raising is certain to result from the consistent use of a line of pure-bred sires, and success will be most marked when following closely in the direction advocated.

STANDARDIZED PACKING FOR EXPORT, WITH READY RECKONER FOR THE PACKING SHED.

By Basil Krone, Orchard Supervision Branch.

The aim of this article is to put before Victorian fruit-growers and others interested in packing fruit for export a kind of Ready Reckoner which will enable them to ascertain readily which style of pack would be best to employ in varying circumstances.

The diagonal, or numerical cheek pack as it is sometimes called, is the standard pack for the Australian bushel dump export case, and is the one used in most packing sheds throughout Victoria. But such a big variation exists between packers, sometimes in the same shed, that perhaps, even though the same variety and grade of apples are being packed, it may happen when the cases are opened at a central market no two are the same.

This, of course, is not standardizing, and upon investigation it will be found that, while some of the packers are experienced and fully understand the system, others only partially understand it, and when nearing the top of the case they find that the fruit will not come to the correct height; then, perhaps, they place the apples in the last layer directly on top of the fruit in the layer beneath, which has not been properly packed, and this often results in a slack pack.

The aim of fruit-growers and co-operative sheds should be to have the same number of fruit in each case of a given size, so that one could say immediately he saw a case exactly how many apples it contained.

The Standard Diagonal (Cheek) Pack.

There are several systems of packing fruit, and each system is complete in itself; therefore it is not necessary to combine any of the systems to pack fruit. The system of diagonal cheek packing has been adopted in Australia for most of our fruits, such as apples, pears, peaches, plums, &c. Apart from the fact that the fruit is less liable to be bruised, this method adapts itself to our Australian dump export case more readily than other packs, and automatically insures that, no matter what the size or shape of the fruit may be, all can be packed to the correct height, and no two fruits will rest directly on top of each other in any direction, yet all will fit firmly and not be over-pressed or bruised. Should open spaces be desired to admit free circulation of air between each specimen in cool storage, this pack will readily lend itself to such a procedure. Further, from a selling or buying point of view, not only is the diagonal pack more attractive should the case be opened on the top or the side, but the buyer knows immediately how many apples are in the case. For instance, in purchasing a consignment of Jonathans (a medium-shaped apple) which has been properly packed, a buyer knows exactly how many apples he will receive, whether it be one or a thousand cases, and this should be so whether he buys from the north, south, east, or west of the State. For this reason, buyers are more anxious to purchase fruit in a standard pack than that packed in varying methods or without any method at all.

Fig. 1.—Wrapping Apples for Packing.

Fig. 2.—Beginning to Pack.

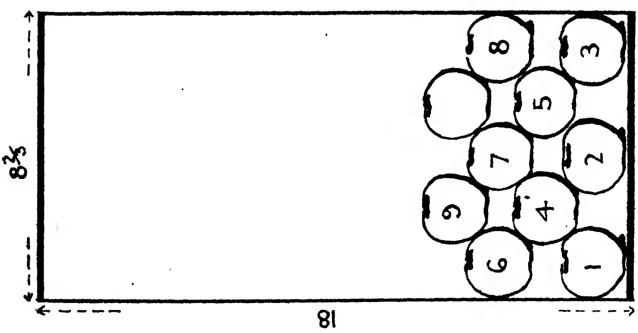


FIG. 3

How to commence bottom layer of 3-2 pack.

(Continue in this way till layer is finished.)

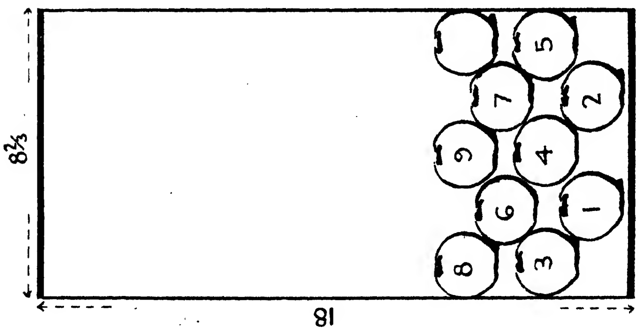


FIG. 4

How to commence each alternate layer of the 3-2 pack.

(Fruit placed in spaces of layer below.)

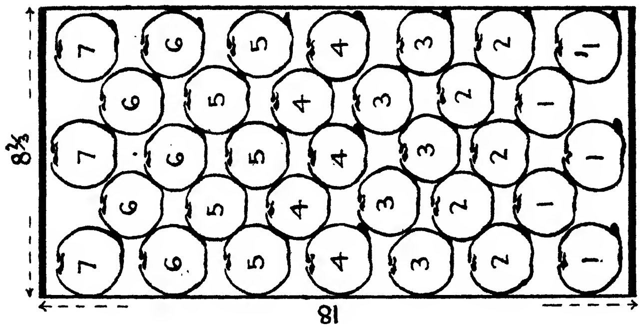


FIG. 5

3-2 pack and 7-6 layer. Total, 228 apples.

In all the States of the Commonwealth the diagonal pack has been adopted, but at times some packers have not understood the system completely, and consequently are unable to bring the fruit to the correct height in the case. To those who have not already adopted the standard pack, the proof that the diagonal system is the best is that almost all who have adopted the system have never reverted to the older methods.

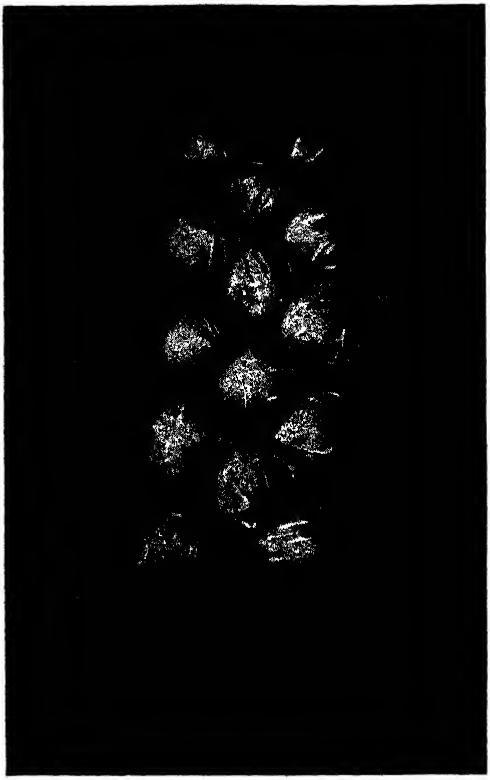


Fig. 6.—The 3–2 Pack.

(This case was previously packed on the 2–2 system, and left a space between the upper layer and the top of the case. Packed on the 3–2 method the fruit came just to top of the case.)

In many of our packing sheds trouble has arisen in filling the cases to the correct height, some coming too low, resulting in a slack pack with consequent bruising of fruit while in course of transport; others are packed too high, which means over-pressed fruit, and, since the art of good packing is to be able to place all varieties, shapes, and sizes to the correct height in the case, special reference is made to the overcoming of this difficulty.

The Beginner Learning to Pack.

The packing of fruit for export is really a simple process, and almost any person can, with a little practice and instruction, become thoroughly acquainted with the necessary procedure for bringing the fruit to the correct height in the case. The learner should practise slowly on the first few cases of each size until he has a complete grip of the system, and soon he will be able to pack quite a reasonable number in a day, and every case will be neat and attractive.

The easiest way to explain the system is by diagrams, and several of these are to be found on subsequent pages.

At first, let us consider the grading of fruit into the following sizes:—2¼, 2½, 2¾, and 3 inches in diameter, which are to be packed into dump cases, the inside measurement of which should be 18 x 8⅝ x 14¼ (2,223 cubic inches). In packing the 2¼-in. size, the procedure is as follows:—First place a thin layer of wood wool or a corrugated strawboard in the bottom of the case to protect the fruit. Take a sheet of tissue paper in one hand and place an apple calyx end in the paper, folding the ends of the paper across the stalk and beneath on the lower cheek of the apple (the ends of the paper will serve as a pad for the fruit to rest on). (See Fig. 1 and Fig. 2.) Then place the fruit in the bottom of the case as shown in Fig. 3, and continue until the layer is finished. This is called the 3–2 pack on account of commencing with 3 apples, then 2, and again 3, and 2, and so on. It is very important that the second layer must rest in the spaces of the bottom layer and not directly on top of the fruit in it. Therefore, the second layer will commence with two apples instead of three, as in the first layer. How to commence the second and each alternate layer is illustrated in Fig. 4.

Fig. 5 shows the medium-shaped 2¼-in. apple on the 3-2 pack. It will be noticed in Fig. 6 that each apple is facing in a certain direction. The outside ones on the top row of this case were left unwrapped in order to show more clearly the position of each fruit. All the other apples in the case were facing the same way. This is one of the customs in packing apples for export. It has been recognised that an apple is harder round the calyz end than on the cheek. It is usual, therefore, to place each apple on an angle, in order that a portion of this harder part of the fruit will come in contact with the side of the case instead of the full cheek. Thus when cases are being stacked on their sides in railway trucks, boats, &c., the chance of bruising is minimized. For this reason the cheek pack is adopted in nearly all sheds in the Commonwealth, instead of the calyx or flat pack. In this latter pack, where the full cheek of the apple is exposed to the side of the case, if the side lathes have been cut too thin, which often happens, the fruit is very liable to be damaged.

All varieties and shapes of the smaller apples are packed on the 3–2 cheek pack. Fruit from 2½ to 3 inches in diameter are packed on what is known as the 2–2 cheek pack (Fig. 7). The method of placing the bottom layer can be seen at a glance. The second layer is shown in Fig. 8.

Fig. 9 will show how to count the layer of the 2–2 pack. Fig. 10 illustrates a case of 2¾-in. Jonathans—a medium-shaped apple—packed on this method. Both the lid and one side have been taken off, and

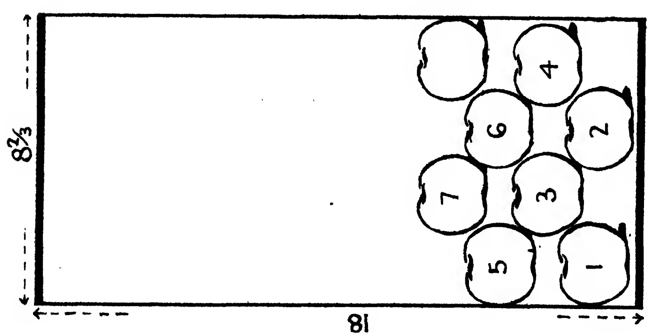


FIG. 7

How to commence the 2-2 pack.
(Continue in this way till layer is finished.)

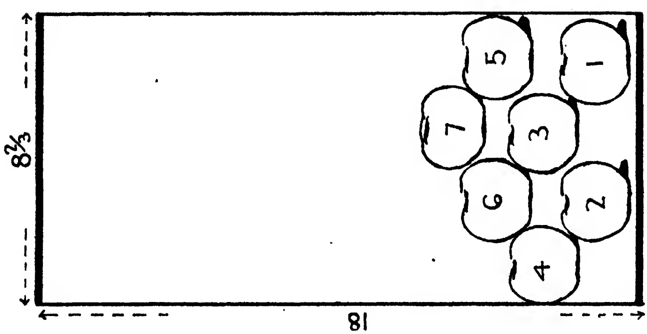


FIG. 8

How to commence second layer of 2-2 pack.
(Place fruit in spaces of layer below.)

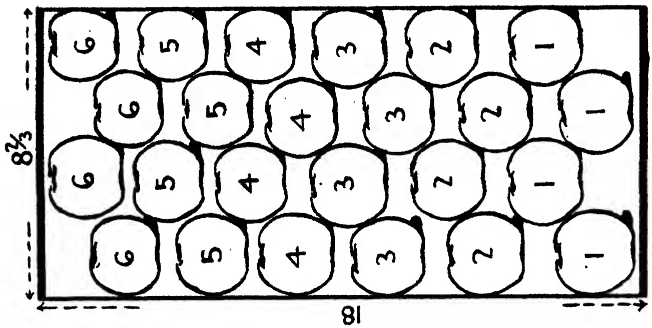


FIG. 9

2-2 pack and 6-6 layer. Total, 144 apples.

it can be clearly seen that no two fruits are resting on top of each other, and the diagonal system shows itself on the side as well as the top of the case.

Apples over the 3-in. grade (very large) will pack on the 2–1 pack (Fig. 11). It is very important that in every pack no two of the fruit will rest directly the one on top of the other, but each will have a space or pocket beneath it. It is well to mention here that any fruit large enough to pack on the 2–1 system is too large for export, and should be sold on local markets, as it does not keep as well as the smaller fruit, particularly if picked from young trees.

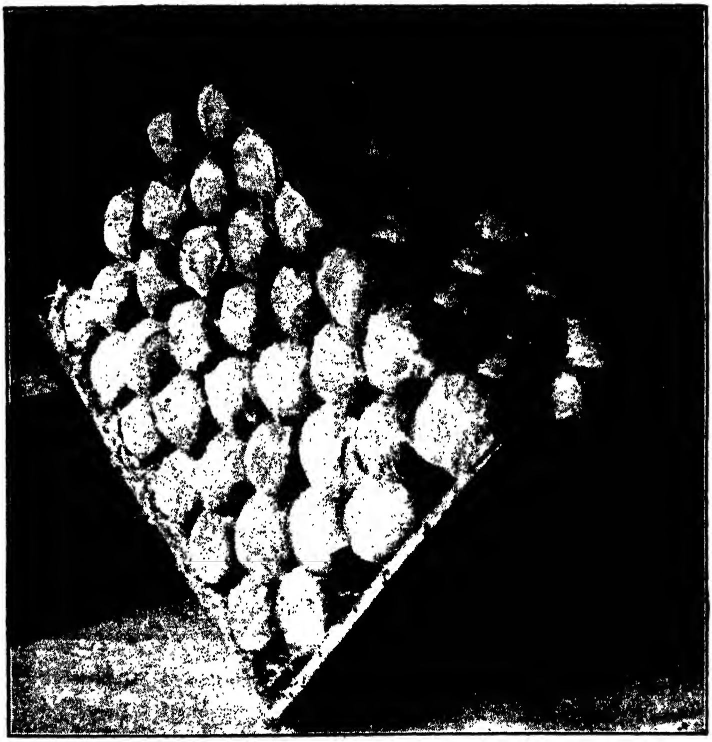


Fig. 10.—A Case of Jonathans Packed on the 2–2 System.

The art of packing a good case is to get all sizes and shapes to the correct height, and the beginner will almost certainly find that this cannot easily be done—the fruit will either be too high or too low. A form of Ready Reckoner has, therefore, been drawn up, which will be useful for the learner, and at times also to the experienced packer when commencing a new season.

The amount of space or size of pocket between each fruit in a layer will decide whether the top layer will be in correct position. If these spaces be large or small, the fruit will come high or low accordingly.

The Ready Reckoner indicates which packs to adopt for the various shapes and sizes. This may be thought unnecessary, but it will often be found of use. For instance, when packing Jonathan apples of a $2\frac{1}{2}$-in. grade it may be these will pack very neatly on the 2–2 pack, but not reach the top of the case, yet not leave room for another layer. All 2–2 packs contain six layers, and all 3–2 packs contain seven layers (see Ready Reckoner); and, by packing the $2\frac{1}{2}$-in. grade fruit on the 3–2 instead of 2–2 system, the size of the pockets or spaces will be made slightly larger, thus the extra layer, which is in all 3–2 packs, will come nicely to the top of the case.

Fig. 12 shows large $2\frac{1}{2}$-in. grade Jonathans packed on the 3–2 instead of 2–2 system, which latter would have come too low when finished. Fig. 6 (page 264) shows a case of smaller fruit of the same grade, which likewise should be packed on the 3–2 system. The writer specially packed these two cases of the $2\frac{1}{2}$-in. grade apples, as many packers have difficulty in bringing them high enough in the case, and many packs of this grade are found to be slack on arrival at their destination. It will be noted that both cases are packed on the 3–2 system, but one has the 5 x 5 layer, which means the case contains 175 apples, and the other the 6 x 5 layer, this case containing 193 apples. It is, of course, possible and quite correct to pack some shapes of $2\frac{1}{2}$-in. grade on the 2–2 pack. The Ready Reckoner shows this.

It is the same with the 2–1 pack. If it comes too low, it should be altered to the 2–2 pack. Of course, only a certain number of fruits must be in each layer, otherwise the pockets or spaces may be too large or too small, and the fruit come too high or too low. The Ready Reckoner will show the number of apples to be put in each layer; and, if they are graded carefully, the packing will take care of itself.

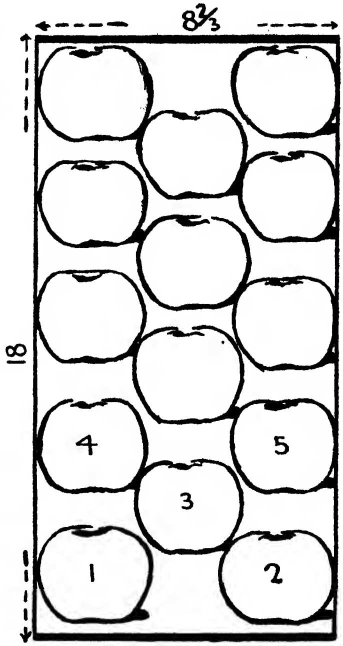


FIG. 11

The 2–1 Pack.

(Alternate layers rest in spaces of lower layers, as in other packs.)

Nailing Down.

Nailing the lid on the case is one of the most important operations, and it is a pity to see so often good fruit subjected to rough dumping on a hard floor in order to get the lid to lie flat.

If the grading be carefully done and the packing chart used, it will be found that the fruit will be firmly packed, and when the lid is on there will be only a very slight bulge (about $\frac{3}{8}$ inch) top and bottom to allow for shrinkage. When nailing the lid on there should be little

or no dumping, and this can be managed by placing two pieces of 3-in. x 1-in. battens parallel on the floor and just far enough apart to allow the edges of the case to rest on them; the bottom of the case will then be clear of the floor, and the lid nailed on without dumping and with less bruising. A nailing-down press is used in America, but the use of battens as just suggested is quite effective. If long battens are used, several cases can be nailed down at a time. Fig. 13 shows the lid being placed on a case standing on battens.

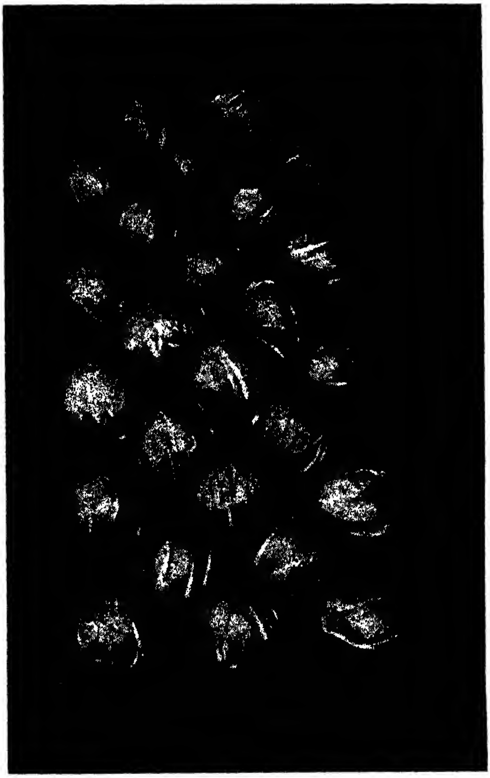


Fig. 12.—Case of 2½-inch Jonathans Packed on the 3-2 System.

(If packed on the 2-2 method the fruit would not reach the top of case)

When large numbers of cases have to be made or nailed down, the use of a wire-hair comb with long teeth sufficiently wide apart for the nails to fit between will be found of great assistance in picking up quantities of nails with their heads turned the one way, ready for nailing. An American nail stripper is obtainable for this purpose, but the hair comb is commonly used in Australia. A thin layer of wood wool or a corrugated cardboard should first be placed in the case before

the fruit is packed, and again on the top layer before the lid is nailed on; this protects the fruit from being cut by the lids and bottoms, especially if these have been cut in two pieces.

How to Use the Ready Reckoner.

The arrows in the Ready Reckoner point to packs by which most of our commercial varieties can be brought to the correct height; but, of course, with abnormally shaped ones, the less common packs may be found the most suitable. The most important act is to get the correct number of apples in the bottom layer (Fig. 5 and Fig. 9). These diagrams illustrate the 3–2 and 2–2 packs, which are packed in layers described as the 7 x 6 and 6 x 6 layers. Attention is particularly drawn

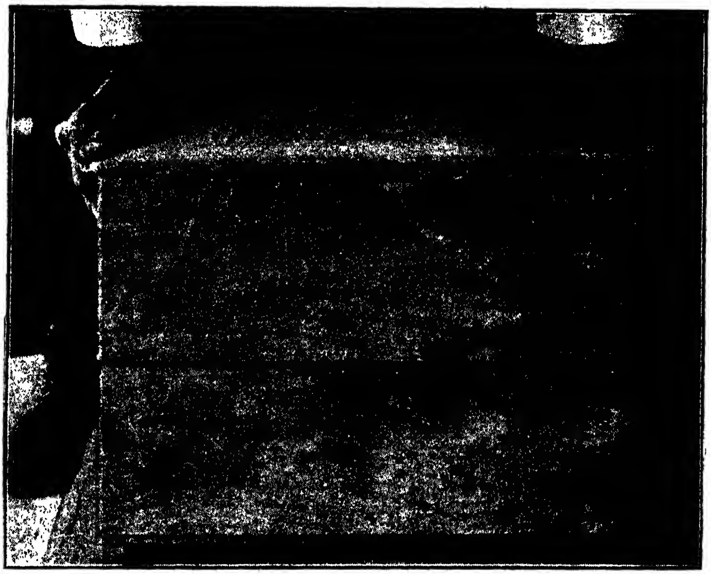


Fig. 13.—Lid being Placed on Case.

to the description of the layer as well as the pack, as everything depends on the layer in bringing the fruit up exactly to the top of the case.

When grading, most packers divide each grade into two, that is, they pack small 2¼ inch and large 2¼ inch, small 2½ inch and large 2½ inch, and so on, as a ¼-in. range is allowed between each size. For instance, a 2¼-in. apple would mean any size not less than 2¼ inches in diameter and not more than 2½ inches; 2½-in. grade would be from 2½ to 2¾ inches; and 2¾in. grade would be from 2¾ to 3 inches; above 3 inches and not more than 3¼ would be 3-in. grade.

To standardize the pack, all cases should contain the same number of apples for their respective sizes and grade, and, no matter whether one or 1,000,000 cases were opened, the number in each should correspond

READY RECKONER FOR THE PACKING SHED.

STANDARDIZED APPLE PACKING FOR EXPORT—DIAGONAL CHEEK SYSTEM.

Inside case measurement, 18 x $8\frac{2}{3}$ x $14\frac{1}{4}$ = 2,223 cub. inches.

This Ready Reckoner might be copied on a card and hung in a conspicuous place in the packing shed in order that reference could be made to it when necessary.

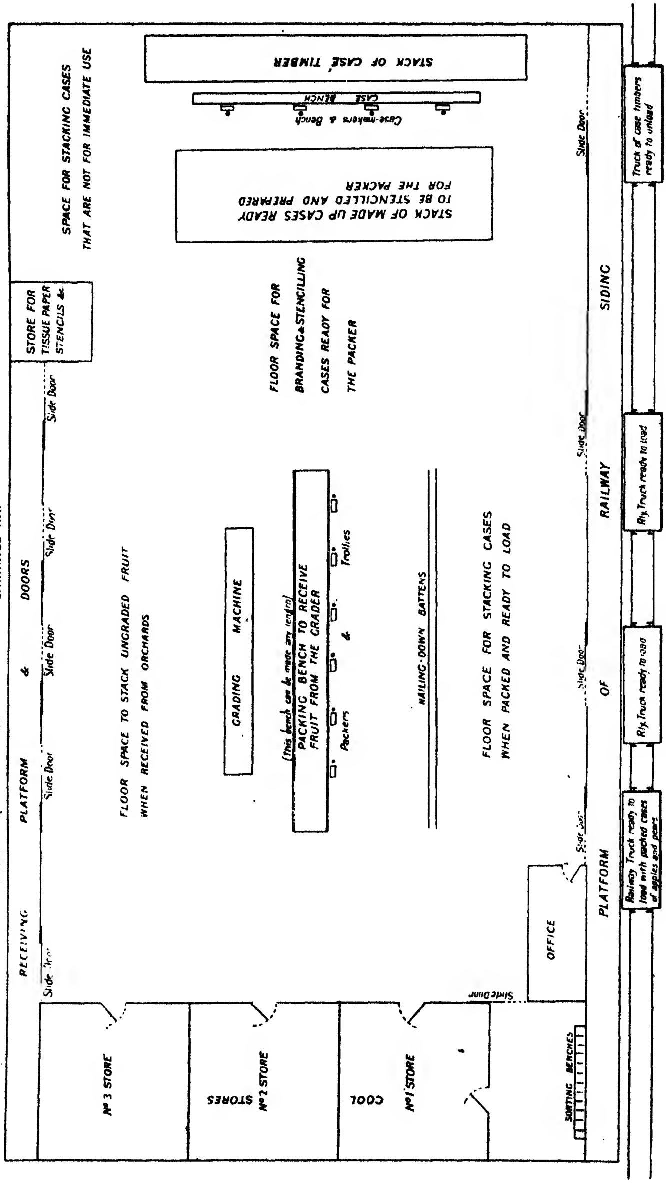
The Apples must fit firmly and no two fruits rest directly on top of each other.

The Arrows indicate the packs mostly used in packing sheds.

All 3—2 packs contain 7 layers.
,, 2—2 ,, ,, 6 ,,
,, 2—1 ,, ,, 5 ,,

Name of Pack.	Description of Layer.	Number of Layers in Case.	Total Number of Apples in Case.		
3-2	9 x 8	7	298		
3-2	8 x 8	7	280		
3-2	8 x 7	7	263		
3-2	7 x 7	7	245	←Small or flat shape	of $2\frac{1}{4}$-inch grade
3-2	7 x 6	7	228	←Medium shape	
3-2	6 x 6	7	210	←Pearmain or long shape or large size	
3-2	6 x 5	7	193	←Small or flat shape	of $2\frac{1}{2}$-inch grade
3-2	5 x 5	7	175	←Medium shape	
2-2	8 x 7	6	180		
2-2	7 x 7	6	168	←Large flat shape (seldom used) of $2\frac{1}{2}$-inch grade	
2-2	7 x 6	6	156	←Small or flat shape	of $2\frac{3}{4}$-inch grade
2-2	6 x 6	6	144	←Medium shape	
2-2	6 x 5	6	132	←Pearmain or long shape or large	
2-2	5 x 5	6	120		
2-2	5 x 4	6	108	←Small or flat shape of 3-inch grade	
2-2	4 x 4	6	96		
2-1	7 x 7	5	105		
2-1	7 x 6	5	98		
2-1	6 x 6	5	90	←Medium shape	of 3-inch grade
2-1	6 x 5	5	83	←Pearmain or long shape or large	
2-1	5 x 5	5	75		
2-1	5 x 4	5	68		
2-1	4 x 4	5	60		
2-1	4 x 3	5	53		
2-1	3 x 3	5	45		

GROUND PLAN OF PACKING & CASE-MAKING SHED



(This plan is not drawn to any scale.)

Cases, Packing Paper, Branding, &c.

CASES.

Too much cannot be said about the varying thicknesses in which some of our case timber is cut. Usually cases are a great deal too thin and flimsy; the side lathes have in many instances spaces between them much too wide, and, if cut at all thin, these warp and the fruit suffers. Many complaints come from overseas about the flimsy character of our hardwood cases. The side lathes should not be less than $\frac{3}{8}$ inch in thickness, and $\frac{1}{2}$ inch space between each lath is ample for apple cases. The lids and bottoms should not be less than $\frac{1}{4}$ inch in thickness. A well cut case should be strong enough to hold an ordinary person standing on it when placed on its side empty, and the boards should not bulge in.

Case ends should be cut $\frac{3}{4}$ x $14\frac{1}{4}$ x a little over $8\frac{2}{3}$ to allow for shrinkage.

Side lathes should be cut $\frac{3}{8}$ x $4\frac{11}{16}$ x $19\frac{1}{2}$.

Lids and bottoms (in one piece, if possible), $\frac{1}{4}$ x $8\frac{2}{3}$ x $19\frac{1}{2}$.

The inside measurement of this case when made up will be 18 x $8\frac{2}{3}$ x $14\frac{1}{4}$, and contain 2,223 cubic inches.

FRUIT CASE DIMENSIONS.

Australian dump bushel, inside measurement, 18 x $8\frac{2}{3}$ x $14\frac{1}{4}$ = 2,223 cubic inches (export trade).

Australian dump half-bushel, inside measurement, 18 x $8\frac{2}{3}$ x $7\frac{1}{8}$ = $1,111\frac{1}{2}$ cubic inches (export trade).

Australian half-bushel, grape, inside measurement, 18 x $11\frac{3}{4}$ x $5\frac{1}{4}$ = 1,110 cubic inches (export trade).

Australian flat bushel, inside measurement, clear of division, 26 x 6 x $14\frac{1}{4}$ = 2,223 cubic inches (Inter-State trade).

Australian flat half-bushel, inside measurement, clear of division, 26 x 6 x $7\frac{1}{8}$ = $1,111\frac{1}{2}$ cubic inches (Inter-State trade).

Australian orange export, inside measurement, clear of division, $24\frac{3}{4}$ x 12 x 12 = 3,564 cubic inches (export trade).

Australian pear trays, inside measurement, 18 x $3\frac{1}{4}$ x $14\frac{1}{4}$ = $833\frac{5}{8}$ cubic inches (export trade).

Australian pear trays, 18 x $2\frac{7}{8}$ x $14\frac{1}{4}$ = $737\frac{7}{16}$ cubic inches (export trade).

TISSUE PAPER.

All fruit for export should be wrapped in tissue paper. This acts as a cushion, and holds the fruit nice and snug, absorbs surplus moisture, prevents disease and decay spreading from one fruit to another, and, in addition, makes the pack more attractive. Some reams of tissue papers of varying sizes have been counted, and average as follows (this will give the grower an idea of how many apples or cases a ream will pack):—

Size.	Papers per Ream.	Depth of Bundle or Ream.	——
8 x 8 9 x 9 10 x 10	500 sheets 2,800 „ 3,000 „	$\frac{3}{4}$ of an inch 4 inches $4\frac{1}{2}$ „	Approx. 250 sheets of 10 x 10 tissue per lb. and 370 of 8 x 8.

NAILS.

Generally, 1¼-in. 14 or 15 gauge nails are used when making cases. Sometimes 1½-in. nails are used, but the 1¼-in. 15-gauge will be found the most economical.

For 1,000 dump cases, approximately 1 cwt. of 1¼-in. 15-gauge nails will be required.

For 950 flat bushel cases, approximately 1 cwt. of 1¼-in. 15-gauge nails will be required.

For 1,400 56-lb. dried fruit boxes, approximately 1 cwt. of 1¼-in. 15-gauge nails will be required.

BRANDING AND STENCILLING.

All cases should bear a record of the quantity contained—"One Imperial Bushel" or "One-half Imperial Bushel," and so on. On one end should be shown the name and address or registered brand of the grower or the central packing shed, and the variety and size of the fruit, and, if desired, also the number. On the other end, the name or commercial brand of the firm to which the fruit is consigned, as well as the port of destination, should be stencilled. The name and address of the maker of the case should also be shown on the case in letters of ¼ inch or so.

Specimen ends of branded cases are shown hereunder:—

WX & YZ LONDON.	[Guarantee Stamp.] — Apples Grown & Packed by T. SXXXH, Somerville, Victoria, Australia. — 144 Jon. 2¾.

Before cases are stencilled, all those that have shrunk should be carefully picked out. These will be useful for picking and storing purposes.

Packing Pears for Export in half-bushel Dump.

The diagrams (Figs. 14 and 14A) will show how pears should be packed on trays according to their size. A layer of wood wool is placed in each tray before packing, and a layer on top of the fruit. The three trays are then stacked together, the bottom of one tray forming the lid for the tray beneath. The top tray has the usual lids nailed on. The package is then cleated or hoop-ironed together to form a dump case.

Picking and Handling Peaches for Cool Storage or Oversea Markets.

When picking peaches that have to be cool-stored or sent overseas, the fruit should be fully developed, but very hard, and showing some colour. Instead of picking into bags or buckets in the usual way, it is suggested that they be picked on to convenient sized trays which have been padded with bags or sacking. The trays can then be placed side by side on the bench in the packing shed, and the peaches packed direct into the cases; this will save much tipping out and unnecessary handling of the fruit. The palm of the hand should hold the peach when picking; the fingers must not press the fruit in any way.

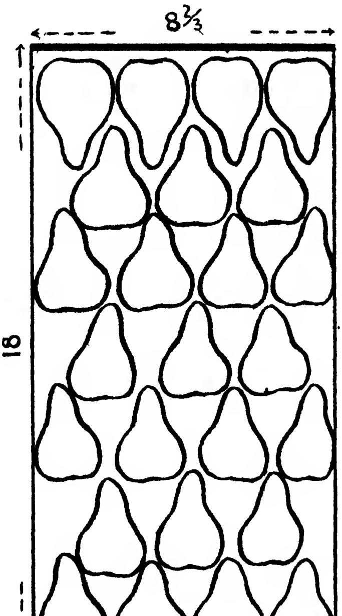


FIG. 14

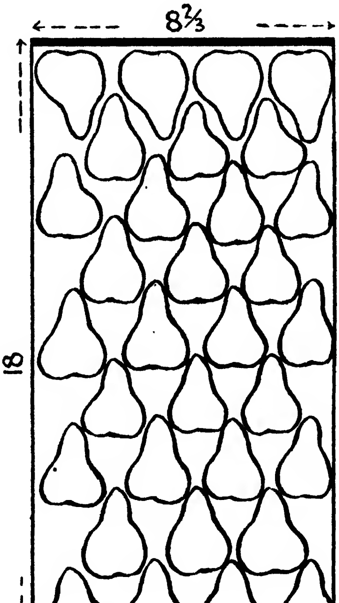


FIG. 14A

Pears Packed in Trays.

Should any grower wish to forward peaches in the half-dump cases for cool storage, as has been done during this season, the following table will be found useful in packing. With peaches for export I would recommend that two sheets of tissue paper be placed round each peach.

On account of the popularity of the half-dump case this season with many growers who exported pears in them instead of trays, a separate

chart has been drawn up to guide the packer in getting the fruit up to the right height. As the half-dump is exactly half the depth of the bushel pump, one would naturally think, if the latter case contained a certain number of fruits, the half dump would contain half that number, but this is not so. Therefore, a separate Ready Reckoner has been worked out for those using the half-dump. Pears are packed on the diagonal, in the same way as apples, except that the stalks should all face one direction; the last pears in the layer, however, should be faced in the opposite direction. Fig. 15 shows this in the 3–2 pack, and Fig. 16 in the 2–2 pack.

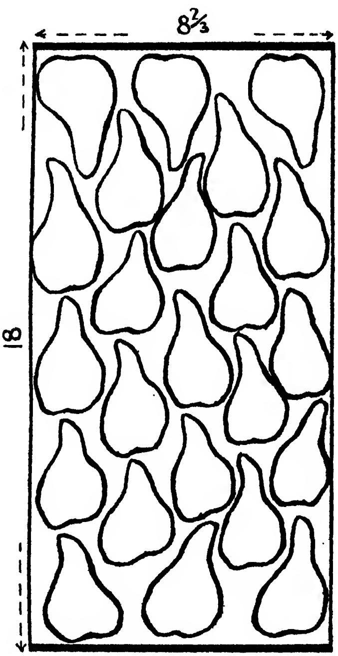


FIG. 15

Pears Packed on the 3–2 System.

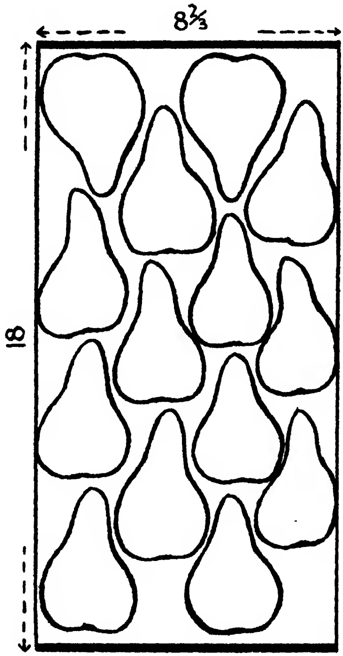


FIG 16

Pears Packed on 2–2 System.

As with apples, a layer of wood wool or corrugated cardboard is placed in the bottom of the case before packing, and again on the top layer before nailing on the lid. Each pear is wrapped in tissue paper, the end of the paper being drawn down round the stalk and folded neatly beneath the pear to serve as a pad or cushion for the other fruit.

It is very necessary to pack pears tightly, as the slightest rubbing or shaking of these fruits will be fatal.

READY RECKONER FOR PEARS.

STANDARDIZED PEAR PACKING FOR EXPORT—DIAGONAL SYSTEM—HALF BUSHEL DUMP CASE.

Inside case measurement, 18 x 8⅔ x 7⅛ = 1,111½ cub. inches.

Pears must fit firmly with no two fruits resting directly on top of each other.

The number shown for each case is approximate; therefore, allow for very long or very short-shaped pears.

All 3–2 packs contain 4 layers.
,, 2–2 ,, ,, 3 ,,

Style of Pack.	Description of Layer.	Number of Layers in Case.	Number of Pears in Case.	
3–2	7 x 7	4	140	
3–2	7 x 6	4	130	←2-inch Medium shape
3–2	6 x 6	4	120	
3–2	6 x 5	4	110	
3–2	5 x 5	4	100	←2¼-inch Medium shape
3–2	5 x 4	4	90	
2–2	7 x 7	3	84	
2–2	7 x 6	3	78	
2–2	6 x 6	3	72	←2½-inch Medium shape
2–2	6 x 5	3	66	
2–2	5 x 5	3	60	
2–2	5 x 4	3	54	←2¾-inch Medium shape
2–2	4 x 4	3	48	
2–2	4 x 3	3	42	←3-inch Medium shape

READY RECKONER FOR PACKING PEACHES IN HALF-BUSHEL DUMP.

STANDARDIZED PEACH PACKING—DIAGONAL SYSTEM.

Inside case measurement, 18 x 8⅔ x 7⅛ = 1,111½ cub. inches.

Peaches must be packed firmly but in no way overpressed.

All 3–2 packs contain 4 layers.
,, 2–2 ,, ,, 3 ,,

Style of Pack.	Description of Layer.	Number of Layers.	Total Peaches in Case.	Size of Peach.
3–2	6 x 5	4	110	2¼ inch diameter
3–2	5 x 5	4	100	2⅜ ,, ,,
2–2	6 x 6	3	72	2½ ,, ,,
2–2	6 x 5	3	66	2⅝ ,, ,,
2–2	5 x 5	3	60	2¾ ,, ,,
2–2	5 x 4	3	54	2⅞ ,, ,,
2–2	4 x 4	3	48	3 ,, ,,
2–2	4 x 3	3	42	3⅛ ,, ,,

As all varieties of peaches are an average shape, arrows, to indicate which pack, are not needed. The same size in any variety will pack according to the table. Particularly in peach packing must the numbers in the layers be adhered to, and there must be no loose fruit, otherwise it will come too high and be bruised. Fig. 17 shows a case of Shepparton peaches at the Government Cool Stores, and illustrates the methods of packing the different sizes.

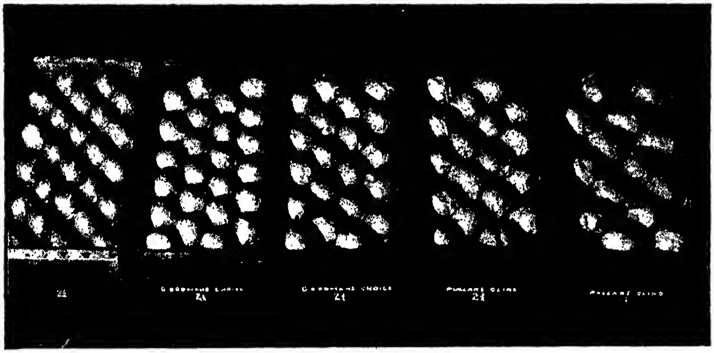


Fig. 17.—Various Packs of Peaches.

Questions and Answers.

As the following questions have been asked many times at various lectures and packing demonstrations, they are repeated here, with the answers given:—

Question.—I find, when packing the 2½-in. grade, that the top layer nearly always comes too low, and, to get the fruit to right height, the apples in the top layer have to be placed on top of those beneath, which, of course, spoils the diagonal system. Can you suggest a remedy in order that all the fruit will be diagonally packed and yet come up to the top of the case?

Answer.—The cause of the 2½-in. grade coming too low in this instance is due to packing it on the 2–2 pack. Use the 3–2 packs, which will alter the size of the pockets or spaces. With the 6 x 5 layer (193 apples in the case for the smaller of the grade) and with the 5 x 5 layer (175 apples for the larger of the grade) the fruit will come nicely to the top.

Question.—Why does it matter if apples in some of the layers are resting on top of each other as long as the fruit comes to the correct height and the layers are packed diagonally?

Answer.—Although the fruit in the layers may be packed diagonally, if specimens are pressing directly on top of each other we call it a mixed or a stacked pack. The case does not hold so much fruit if packed in that way, and keen buyers, knowing this, will not pay as much as they will for the standard pack, which contains more fruit. Mixed packs spoil the standardization of packing fruit.

Question.—My 3-in. grade are always too high or too low. I pack them on the 2–1 system generally. Other sizes I can manage well.

Answer.—Change from the 2–1 to the 2–2 system, with the 5 x 4 layer (total, 108 apples), as this alters the size of the pockets or spaces, and is similar to some varieties with 2½-in. grade. If, of course, the fruit is only a fraction low, it would not be necessary to change from one pack to another, but, instead, the pockets could be made smaller by altering the number of apples in the layer by slightly turning the fruit and closing them up, to allow the layer to be, say, 5 x 5 instead of 5 x 4, if the 5 x 4 layer came too low, and so on with all sizes.

Question.—Extremely small sizes, below 2 inches, are difficult to get up on 3–2 pack.

Answer.—A packing table for such a size is not mentioned, as the size is not commercial. However, the 3–3 pack with eight layers (not mentioned in Ready Reckoner) will bring the fruit to the right height.

Practical demonstrations in fruit packing may be arranged for co-operative sheds or growers' associations by applying to Department of Agriculture, Melbourne.

STERILITY IN HYBRIDS.

Mules and jennets, being the result of a reversed cross between the horse and the ass, will not breed. Physiologists find it hard to explain the cause, yet the fact remains, in the words of the scientist, that "all true hybrid Equidæ have proved sterile." Some time since, the Zoological Society in London obtained a fine stallion wild ass from Somaliland, which is, it appears, the only country where the African ass still survives as a wild animal. This stallion ass was crossed with mare asses of other breeds, such as Spanish and Tibetan. As the result of one cross with the latter, a fine female ass of 12 hands in height was obtained. She showed little of the distinctive colour markings of the sire, but except for her large size and almost complete absence of the stripes on the shoulder and along the back, in other respects closely resembled a well-bred donkey of these islands. From her in turn a foal of quite a distinct species has been obtained by crossing her with a pony stallion. The foal is coloured brown like the sire, but in other respects it favours the dam. There is much expectancy whether this hybrid will prove sterile or not. If it should turn out capable of breeding, as its colouring and shape suggest may be the case, it will be an interesting exception to a peculiar natural law that hitherto has not been known to be broken.

—*Farmers' Union Advocate,* New Zealand.

REGISTRATION OF STALLIONS.

Second Annual Report under the Horse Breeding Act 1919.

W. A. N. Robertson, B.V.Sc., Chief Veterinary Inspector.

The second year of operations under the Horse Breeding Act has been brought to a close with no more serious complaint from those engaged in the industry than that delay occurs in notifying owners of the result of the examining officer's inspection. In such cases, however, the delay has in almost every case been due to omissions on the part of owners themselves.

The Act requires that the owner of a stallion shall, on or before the 1st of July each year, make application for registration, and the application must be accompanied by the statutory fee of 20s. If owners of stallions which were last year registered as five-year-olds or over make early application, they may have their horses registered for the ensuing year at any time from now onwards. When applying, they should forward the old registration certificate; failure to do this will lead to correspondence and consequent delay in issuing a new certificate. If, in cases of this sort, immediate application for re-registration were received, certificates would be promptly issued. Thus, in the rush of the season, more time could be given to those cases where examination is necessary.

Those owners who have stallions that will be five years old or under during the coming season should also make early application, so that suitable arrangements may be made for the examinations. If an application be completed, as required by the Act, the veterinary officer deputed to make the examination, knowing this, will, if the owner so desires, inform him orally of his decision, and thus he will not have to await official notice, which cannot be sent till at least a day or so after the receipt at the head office of the inspector's report. If, however, an application be not in order, the examiner, not having been instructed to examine the horse, will refuse to inform the owner of his decision.

It is by no means rare for an owner to present a stallion for examination at an advertised parade, notwithstanding that no notification whatever has been given to the authorities. Though the officer conducting the parade may refuse to inspect such a horse, and insist on the owner applying for a special examination, the cost of which he would have to bear, this course is not adopted. Instead, the horse is examined, and a report made to head-quarters. Owners who have followed the correct procedure are immediately notified from Head Office, but those who have failed in this respect are not informed of the result of examination until their applications are in order. This means delay, as such owners must be communicated with and notified of their failure.

The work of checking applications and examinations is one requiring some time, and the four or five veterinary officers who conduct the examinations each hold, on an average, two parades a day. In many instances four or five parades are visited by one officer. This means a degree of "rush work" for the recording staff. Yet in no case last season where an application was properly made did more than the statutory fourteen days elapse before any owner was officially informed

of the result of an examination. A little forethought on the part of owners is all that is required to avoid any cause for complaint.

It is highly satisfactory that no more serious complaint can be formulated, and it serves to show that breeders are alive to the importance of the Act, and recognise the benefits to be derived from the system of registration. The delay in bringing similar legislation into operation in adjoining States has, no doubt, also been a cause of satisfaction to some, as it has enabled owners of rejected stallions to dispose of their horses at a minimum loss, and large numbers have crossed the borders.

The effect of this will be to give Victoria a considerable lead in the establishment of sound lines of blood, and to create a demand for horses bred in the State. The outlook for the horse breeding industry is bright, for with the impetus of immigration and closer settlement, a large number of draught types will be required. Motor traction may adversely affect the breeding of lighter types, but it will be a long day before it can be brought to such a stage as to interfere with the use of the draught horse on closely settled areas.

Review of Last Season.

Application for registration was made for 1,719 stallions, an increase of 46 over the first year. Of this number, 960 were registered without examination, having been registered as five-year-olds the previous season. Of the balance, 149 were stallions which had previously been rejected in regard to which it was incumbent upon the owners to make the statutory application, though knowing that registration would be refused. This provision of the Act has been a cause of some dissatisfaction, but it is necessary to guard against unregistered stallions being used for stud purposes; as with the information of the whereabouts of such horses a check can be kept on their operations. The effect of this provision has been, as already stated, that a number of rejected horses have left the State, a number have been castrated, and there are a few cases in which owners have not made application for registration. These defaulters will shortly be dealt with through the Courts for a breach of the Act and regulations, and there is little doubt that their number will be a rapidly diminishing one.

The remainder of applications, which were for horses five years of age or under, were dealt with by examination by veterinary officers. Six hundred and ten stallions were so examined, and of this number 193, or 31.6 per cent., were rejected.

Analyses of Rejections.

Of the 193 stallions rejected, 105, or 17.2 per cent., were refused registration as being below a reasonable standard, and 88, or 14.43 per cent., as being unsound. In the previous year, 23 per cent. were rejected under the first heading, and 22 per cent. under the second. The reason for the high percentage on that occasion was dealt with in last report, and there is every reason to believe that it will be non-recurring, and that the number of rejections will steadily decrease.

As in the previous year, draught horses show the greatest number of rejections, the total being unsound 61, or 19.6 per cent., and below standard 36, or 11.58. This closely approximates the rejections made during the last year of examination under departmental regulations in force before the present Act was introduced.

Further analyses shows that, as in previous years, sidebone was the most common of the hereditary unsoundnesses, 16.7 per cent. being found so affected, whilst 4, or 1.29 per cent., were affected with ringbone.

In light horses, bone spavin was the principal unsoundness detected, 12, or 6.19 per cent., being rejected under this head, whilst ponies, as in previous years, were found relatively free from unsoundness, only 6, or 5 per cent., being rejected.

Appeals.

Of the total number of stallions rejected—193—the owners of eleven were dissatisfied with the opinion of the veterinary officers, and lodged appeals. Eight were refused registration on the ground that they were not of a reasonable standard, one because of unsoundness, while two were rejected under both heads. The Boards appointed for the purpose duly considered the appeals, and were unable to support the owner's contention in any case, the whole number being dismissed, and the opinion of the veterinary officer upheld.

Parades for Coming Season.

The time-table of parades for the coming season, which appears herewith, has been drawn up so as to avoid as far as possible the necessity for any stallion having to be brought more than approximately 10 miles. If owners will carefully study the time-table, and select the most convenient centre, and give due notice of their intention to present their stallions, the whole of the examinations will be conducted prior to the opening of the breeding season. Additional parades cannot be arranged for until the present time-table is completed. This will mean that they cannot be held till very late in the season, and, further, will involve owners in additional expenditure, as they will have to meet the expense of such special parades. It should also be noted that while centres have been allotted as shown, a veterinary officer will not attend unless applications indicate that a horse or horses will be present at such centre.

Emphasis must be laid on the following points:

1. The owner of every stallion must apply for registration prior to 1st July.

2. All registrations made during the past season automatically expire on 30th June.

3. With the application for registration a fee of 20s. must be forwarded, and the expired certificate returned.

4. The centre most convenient for examination must be stated on the application.

5. *A veterinary officer will not attend any centre unless notice is given that a stallion will be presented for examination.*

6. If a stallion is sold, the certificate of registration must be officially transferred, otherwise the registration lapses.

7. In order to avoid delay and misunderstanding, early application for registration should be lodged.

I desire to again record my appreciation of the assistance rendered by police officers and secretaries of agricultural societies in the conduct

of inspection parades, without which the work of the examining officers would have been greatly increased.

TABLE SHOWING DETAILS OF EXAMINATIONS.

—	Draught.		Light.		Pony.		Total.	
	Examined. 311	Certificated. 214	Examined. 194	Certificated. 125	Examined. 105	Certificated. 78	Examined. 610	Certificated. 417
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.
Bog Spavin ..	2	·64	2	1·04	..	..	4	·66
Bone Spavin ..	..	..	12	6·19	3	2·86	15	2·46
Curb	1	·32	1	·52	2	1·90	4	·66
Ringbone ..	4	1·29	6	3·10	1	·95	11	1·80
Sidebone ..	52	16·72	..	..	..	..	52	8·52
Roaring ..	2	·64	..	..	..	..	2	·33
Through unsoundness ..	61	19·61	21	10·85	6	5·71	88	14·43
Through disapproval ..	36	11·58	48	24·74	21	20	105	17·21
Total ..	97	31·19	69	35·59	27	25·71	193	31·64

STALLION PARADES.

TIME TABLE, 1922-23.

Provided that the applications for registration received indicate that a horse will be in attendance there for examination, a parade will be held at each of the following places :—

Date.	Parade.	Time.	Officer Arrives.	Officer Departs.
Tuesday, June 27 ..	Mildura ..	2 p.m. ..	8.40 a.m. ..	7.30 a.m. (28th)
Wednesday, June 28..	Ouyen ..	10 a.m. ..	10 a.m. ..	Driving
Wednesday, June 28..	Walpeup ..	12 noon ..	Driving ..	Driving
Wednesday, June 28..	Underbool ..	2 p.m. ..	Driving ..	Driving
Wednesday, June 28..	Tutye ..	3.30 p.m...	Driving ..	Driving
Wednesday, June 28..	Murrayville..	4.30 p.m.	Driving ..	Driving
Thursday, June 29 ..	Dunolly ..	12 noon ..	9.7 a.m. ..	4.31 p.m.
Thursday, June 29 ..	Maryborough	5 p.m. ..	5 p.m. ..	5.20 a.m. (30th)
Tuesday, June 27 ..	Speed ..	10 a.m. ..	5.1 a.m. ..	10.54 a.m.
Tuesday, June 27 ..	Curyo ..	2 p.m. ..	12.24 p.m. ..	8.45 p.m.
Wednesday, June 28..	Woomelang	11 a.m ..	9.45 p.m. (27th)	11.55 a.m.
Wednesday, June 28..	Watchem ..	3 p.m. ..	1.23 p.m. ..	6.52 p.m.
Thursday, June 29 ..	Birchip ..	11 a.m. ..	7.40 p.m. (28th)	12.57 p.m.
Thursday, June 29 ..	Donald ..	2.30 p.m...	2 p.m. ..	5.50 a.m. (30th)
Friday, June 30 ..	St. Arnaud	10 a.m. ..	7.11 a.m. ..	3.7 p.m.

STALLION PARADES, TIME TABLE—*continued.*

Date.	Parade.	Time.	Officer Arrives.	Officer Departs.
Tuesday, June 27 ..	Sea Lake ..	10 a.m. ..	9.10 p.m. (26th)	Driving
Tuesday, June 27 ..	Nandaly ..	12 noon ..	Driving ..	Driving
Tuesday, June 27 ..	Kulwin ..	3 p.m. ..	Driving ..	Driving
Wednesday, June 28..	Culgoa ..	11 a.m. ..	9.54 a.m. ..	9.54 a.m. (29th)
Thursday, June 29 ..	Wycheproof	11.40 a.m.	11.40 a.m. ..	12.25 p.m.
Thursday, June 29 ..	Charlton ..	3 p.m. ..	1.5 p.m. ..	1.22 p.m. (30th)
Tuesday, July 4 ..	Rainbow ..	2 p.m. ..	9.55 p.m. (3rd)	3.10 p.m.
Tuesday, July 4 ..	Yaapeet ..	4.5 p.m. ..	4.5 p.m. ..	5.30 p.m.
Wednesday, July 5 ..	Jeparit ..	11 a.m. ..	8.10 p.m. (4th)..	Driving
Thursday, July 6 ..	Lorquon ..	11 a.m. ..	Driving ..	12 noon
Thursday, July 6 ..	Yanac ..	1.10 p.m...	1.10 p.m. ..	1.40 p.m.
Friday, July 7 ..	Ballan ..	10.5 a.m...	10.5 a.m. ..	12.7 p.m.
Tuesday, July 4 ..	Goroke ..	3 p.m. ..	1.15 p.m. ..	6 p.m.
Wednesday, July 5 ..	Horsham ..	9 a.m. ..	9.20 p.m. (5th)..	4.58 p.m.
Thursday, July 6 ..	Natimuk ..	10 a.m. ..	Driving ..	Driving
Thursday, July 6 ..	Toolondo ..	12 noon ..	Driving ..	Driving
Tuesday, July 4 ..	Hopetoun ..	11 a.m. ..	9.40 p.m. (3rd)..	7.20 a.m. (5th)
Wednesday, July 5 ..	Warracknabeal	2 p.m. ..	10 a.m. ..	7.30 p.m.
Thursday, July 6 ..	Beulah ..	11 a.m. ..	8.55 p.m. (5th)..	11.45 a.m.
Thursday, July 6 ..	Minyip ..	3.30 p.m...	3 p.m. ..	11.50 a.m. (7th)
Friday, July 7 ..	Murtoa ..	12.30 p.m.	12.30 p.m. ..	1.19 p.m.
Monday, July 10 ..	Pyramid ..	2.30 p.m...	2.13 p.m. ..	3.19 p.m.
Monday, July 10 ..	Mitiamo ..	1.30 p.m.	1.29 p.m. ..	1.46 p.m.
Tuesday, July 11 ..	Raywood ..	11 a.m. ..	9.18 a.m. ..	12.42 p.m.
Tuesday, July 11 ..	Tandarra ..	1 p.m. ..	12.56 p.m. ..	4.44 p.m.
Wednesday, July 12..	Bendigo ..	11 a.m. ..	6.10 p.m. (11th)	12.15 p.m.
Wednesday, July 12..	Marong ..	1 p.m. ..	12.44 p.m. ..	5.13 p.m.
Thursday, July 13 ..	Maldon ..	11.30 a.m.	11.30 a.m. ..	Driving
Thursday, July 13 ..	Shelbourne ..	1.30 p.m...	Driving ..	Driving
Thursday, July 13 ..	Castlemaine	3.35 p.m...	3.35 p.m. ..	8.12 p.m.
Friday, July 14 ..	Newstead ..	10.30 a.m.	8.46 p.m. (13th)	11.31 a.m.
Monday, July 10 ..	Ararat ..	3 p.m. ..	1.27 p.m. ..	4.35 p.m.
Tuesday, July 11 ..	Rupanyup ..	4.40 p.m...	4.40 p.m. ..	5 p.m.
Wednesday, July 12..	Marnoo ..	7 a.m. ..	6.5 p.m. (11th)..	8.20 a.m.
Wednesday, July 12..	Lubeck ..	1 p.m. ..	1 p.m. ..	1.43 p.m.
Wednesday, July 12..	Stawell ..	2.45 p.m...	2.41 p.m. ..	9.8 p.m.
Thursday, July 13 ..	Avoca ..	11 a.m. ..	8.20 a.m. ..	1.40 p.m.
Thursday, July 13 ..	Ben Nevis ..	3.30 p.m.	3.26 p.m. ..	Driving
Monday, July 10 ..	Macorna ..	3 p.m. ..	2.50 p.m. ..	9.17 p.m.
Tuesday, July 11 ..	Koondrook..	9.30 a.m...	9.30 a.m. ..	10.30 a.m.
Tuesday, July 11 ..	Kerang ..	2 p.m. ..	11.30 a.m. ..	3.55 p.m.
Wednesday, July 12	Swan Hill ..	10 a.m. ..	5.20 p.m. ..	Driving
Wednesday, July 12 ..	Ultima ..	1 p.m. ..	Driving ..	Driving
Wednesday, July 12..	Lalbert ..	3 p.m. ..	Driving ..	Driving
Thursday, July 13 ..	Piangil ..	10 a.m. ..	8.50 p.m. (12th)	Driving
Thursday, July 13 ..	Manangatang	1 p.m. ..	Driving ..	Driving
Thursday, July 13 ..	Chillingollah	3 p.m. ..	Driving ..	Driving
Monday, July 17 ..	**Royal Show Grounds**	**10 a.m.** ..		

STALLION PARADES, TIME TABLE—*continued.*

Date.	Parade.	Time.	Officer Arrives.	Officer Departs.
Monday, July 24 ..	Tungamah ..	1.30 p.m...	1.21 p.m. ..	3.26 p.m.
Monday, July 24 ..	Devenish ..	4.20 p.m...	4.14 p.m. ..	8.46 p.m.
Tuesday, July 25 ..	Yarrawonga	3.5 p.m. ..	2.5 p.m. ..	7.20 a.m. (26th)
Wednesday, July 26..	Benalla ..	10 a.m. ..	10 a.m. ..	11.25 a.m.
Wednesday, July 26	Rutherglen	2 p.m. ..	1.53 p.m. ..	7.50 a.m. (27th)
Thursday, July 27 ..	Chiltern ..	1.13 p.m...	1.13 p.m. ..	3.45 p.m.
Monday, July 24 ..	Tallangatta..	4 p.m. ..	3.53 p.m. ..	Driving (25th)
Tuesday, July 25	Corryong ..	12.30 p.m.	Driving ..	6 a.m. (26th)
Wednesday, July 26..	Wodonga ..	2 p.m. ..	12.45 p.m. ..	3.5 p.m.
Wednesday, July 26..	Inglewood ..	11 a.m. ..	9.45 a.m. ..	1.32 p.m.
Wednesday, July 26 ..	Boort ..	4.26 p.m...	4.26 p.m. ..	5 p.m.
Thursday, July 27 ..	Quambatook	10.30 a.m.	6.23 p.m. (26th)	11.22 a.m.
Thursday, July 27 ..	Korong Vale	2.32 p.m...	2.32 p.m. ..	3.25 p.m.
Thursday, July 27 ..	Wedderburn Junction	2.30 p.m...	2.30 p.m. ..	3.39 p.m.
Monday, July 31 ..	Kyabram	2 p.m. ..	12.40 p.m. ..	4.37 p.m.
Monday, July 31 ..	Tongala ..	3 p.m. ..	Driving ..	4.12 p.m.
Tuesday, August 1 ..	Tatura ..	10.30 a.m.	5.33 p.m. (31st)	11.42 a.m.
Tuesday, August 1 ..	Echuca ..	1.45 p.m...	1.45 p.m. ..	3.45 p.m.
Tuesday, August 1 ..	Rochester ..	4.30 p.m...	4.25 p.m. ..	9.3 a.m. (2nd)
Wednesday, August 2	Goornong ..	11 a.m. ..	10.8 a.m. ..	12.45 p.m.
Wednesday, August 2	Elmore ..	1.5 p.m. ..	1.11 p.m. ..	1.40 p.m.
Wednesday, August 2	Bamawm ..	3 p.m. ..	Driving ..	Driving
Thursday, August 3..	Gunbower ..	4.1 p.m. ..	4.1 p.m. ..	Driving
Friday, August 4 ..	Cohuna ..	11 a.m. ..	Driving ..	12.30 p.m.
Monday, July 31 ..	Moyhu ..	2 p.m. ..	Driving ..	Driving
Monday, July 31 ..	Whitfield ..	4 p.m. ..	Driving ..	Driving
Tuesday, August 1 ..	Wangaratta	11 a.m. ..	Driving ..	12.39 p.m.
Tuesday, August 1 ..	Bright ..	4.7 p.m. ..	4.7 p.m. ..	6.4 a.m. (2nd)
Wednesday, August 2	Myrtleford ..	2 p.m. ..	7.12 a.m. ..	7.12 a.m. (3rd)
Thursday, August 3..	Beechworth	11 a.m. ..	9.50 a.m. ..	12.51 p.m.
Thursday, August 3 ..	Everton ..	2 p.m. ..	1.11 p.m. ..	3.30 p.m.
Friday, August 4 ..	Euroa ..	10 a.m. ..	6.33 p.m. (3rd)..	11.12 a.m.
Friday, August 4 ..	Seymour ..	1 p.m. ..	12.11 p.m. ..	8.15 p.m.
Monday, July 31 ..	Dookie ..	12.43 p.m.	12.43 p.m. ..	1.3 p.m.
Monday, July 31 ..	Katamatite	2.8 p.m. ..	2.8 p.m. ..	2.55 p.m.
Tuesday, August 1 ..	Nagambie (Railway Station)	9 a.m. ..	7.34 p.m. (31st)	9.57 a.m.
Tuesday, August 1 ..	Shepparton..	2 p.m. ..	11.18 a.m. ..	8.26 p.m.
Wednesday, August 2	Numurkah ..	11 a.m. ..	9.23 p.m. (1st)..	12.38 p.m.
Wednesday, August 2	Strathmerton	1.10 p.m...	1.10 p.m. ..	1.20 p.m.
Wednesday, August 2	Cobram ..	2 p.m. ..	1.57 p.m. ..	3.10 p.m.
Thursday, August 3..	Nathalia ..	2 p.m. ..	1.37 p.m. ..	3.26 p.m.
Friday, August 4 ..	Murchison ..	10 a.m. ..	7.8 p.m. (3rd) ..	10.45 a.m.
Friday, August 4 ..	Rushworth..	11.48 a.m.	11.48 a.m. ..	12.25 p.m.
Friday, August 4 ..	Colbinabbin	1.30 p.m...	1.20 p.m. ..	2.30 p.m.

STALLION PARADES, TIME TABLE—*continued*.

Date.	Parade.	Time.	Officer Arrives.	Officer Departs.
Monday, August 7 ..	Heathcote ..	2 p.m. ..	11.30 a.m. ..	6.23 p.m.
Tuesday, August 8 ..	Alexandra ..	2 p.m. ..	12.30 p.m. ..	4.15 p.m.
Wednesday, August 9	Yea ..	9.30 a.m...	6.33 p.m. (8th)..	10.38 a.m.
Wednesday, August 9	Mansfield ..	2 p.m. ..	1.55 p.m. ..	3.30 p.m.
Thursday, August 10	Kilmore ..	9 a.m. ..	8.30 a.m. (driving)	10 a.m.
Tuesday, August 8 ..	Casterton ..	11 a.m. ..	7.55 p.m. (7th)..	Driving
Tuesday, August 8 ..	Coleraine ..	3 p.m. ..	Driving ..	Driving
Wednesday, August 9	Edenhope ..	12 noon ..	Driving ..	Driving
Wednesday, August 9	Harrow ..	2 p.m. ..	Driving ..	Driving
Wednesday, August 9	Balmoral ..	3 p.m. ..	Driving ..	Driving
Tuesday, August 8 ..	Dartmoor ..	11 a.m. ..	9 p.m. (7th) ..	9.55 a.m. (9th)
Wednesday, August 9	Heywood ..	11.45 a.m.	11.45 a.m. ..	12.15 p.m.
Wednesday, August 9	Portland ..	1.30 p.m...	1.5 p.m. ..	2.55 p.m.
Thursday, August 10	Branxholme	10 a.m. ..	5.25 p.m. (9th)..	11.55 a.m.
Thursday, August 10	Dunkeld ..	1.30 p.m...	1.30 p.m. ..	3.53 p.m.
Thursday, August 10	Hamilton ..	4.33 p.m...	4.33 p.m. ..	Driving (11th)
Friday, August 11 ..	Cavendish ..	10 a.m. ..	Driving ..	Driving
Monday, August 14 ..	Dean's Marsh	11.35 a.m.	11.35 a.m. ..	2.40 p.m.
Monday, August 14 ..	Birregurra ..	3.5 p.m. ..	3.5 p.m. ..	7.56 p.m.
Tuesday, August 15 ..	Colac ..	10 a.m. ..	8.23 a.m. (14th)	11.15 a.m.
Tuesday, August 15 ..	Gellibrand (Railway Station)	12.54 p.m.	12.54 p.m. ..	Continues journey by same train
Tuesday, August 15 ..	Beech Forest	2.30 p.m...	2.30 p.m. ..	3.40 p.m.
Wednesday, August 16	Laver's Hill	10 a.m. ..	5.50 p.m. (15th)	12.40 p.m.
Thursday, August 17	Winchelsea..	10 a.m. ..	7.52 p,m, (16th)	11.10 a.m.
Monday. August 14..	Beaufort ..	2 p.m. ..	12.27 p.m. ..	6.47 p.m.
Tuesday, August 15..	Kaniva ..	11 a.m. ..	2.28 a.m. ..	12.42 a.m. (16th)
Wednesday, August 16	Nhill ..	3 p.m. ..	1.22 a.m. ..	1.32 a.m. (17th)
Thursday, August 17	Dimboola ..	2 p.m. ..	2.13 a.m. ..	2.45 p.m.
Friday, August 18 ..	Willaura ..	11 a.m. ..	8.12 a.m. ..	2.19 p.m.
Friday, August 18 ..	Maroona ..	2.45 p.m...	2.45 p.m. ..	3.15 p.m.
Monday, August 14 ..	Port Fairy ..	4 p.m. ..	3.45 p.m. ..	5.42 a.m. (15th)
Tuesday, August 15 ..	Koroit ..	11 a.m. ..	6.10 a.m. ..	Driving
Tuesday, August 15..	Hawkesdale	2 p.m. ..	Driving ..	3.29 p.m.
Tuesday, August 15 ..	Penshurst ..	4.13 p.m...	4.13 p.m. ..	7.31 a.m. (16th)
Wednesday, August 16	Warrnambool	10.15 a.m.	10.15 a.m. ..	10.55 a.m.
Wednesday, August 16	Terang ..	12.30 p.m.	12.5 p.m. ..	1.30 p.m.
Wednesday, August 16	Mortlake ..	2.5 p.m...	2.5 p.m. ..	Driving
Thursday, August 17	Camperdown	11 a.m. ..	5.13 p.m. (16th)	12.25 p.m.
Thursday, August 17	Timboon ..	2.5 p.m. ..	2.5 p.m. ..	2.45 p.m.
Thursday, August 17	Cobden ..	3.45 p.m...	3.45 p.m. ..	Driving
Friday, August 18 ..	Werribee ..	11.47 a.m.	11.47 a.m. ..	1.15 p.m.
Monday, August 21 ..	Drysdale ..	11 a.m. ..	9.41 a.m. ..	4.6 p.m.
Tuesday, August 22 ..	Meredith ..	10 a.m. ..	9.42 a.m. ..	11.13 a.m.
Tuesday, August 22 ..	Bannockburn	2 p.m. ..	11.38 a.m. ..	4.23 p.m.
Wednesday, August 23	Lismore ..	2 p.m. ..	11.55 a.m. ..	5.25 p.m.
Thursday, August 24	Cressy ..	10.30 a.m.	6.12 p.m. (23rd)	11.5 a.m.
Thursday, August 24	Westmere ..	2 p.m. ..	1.17 p.m. ..	4.7 p.m.
Friday, August 25 ..	Inverleigh ..	10 a.m. ..	7.29 p.m. (24th)	Driving
Friday, August 25 ..	Geelong ..	2 p.m. ..	12.10 p.m. ..	5.55 p.m.

STALLION PARADES, TIME TABLE—*continued*.

Date.	Parade.	Time.	Officer Arrives.	Officer Departs.
Monday, August 21 ..	Waubra ..	1 p.m. ..	Driving ..	Driving
Tuesday, August 22 ..	Skipton ..	11 a.m. ..	Driving ..	Driving
Tuesday, August 22 ..	Linton ..	1 p.m. ..	Driving ..	Driving
Tuesday, August 22 ..	Ballarat ..	4 p.m. ..	Driving ..	7.30 a.m. (23rd)
Wednesday, August 23	Clunes ..	11 a.m. ..	8.54 a.m. ..	1.43 p.m.
Wednesday, August 23	Creswick ..	2.30 p.m...	2.16 p.m. ..	Driving
Wednesday, August 23	Kingston ..	4 p.m. ..	Driving ..	6.13 p.m.
Thursday, August 24	Daylesford ..	2 p.m. ..	7.17 p.m. (23rd)	6.20 a.m. (25th)
Friday, August 25 ..	Kyneton ..	11 a.m. ..	9.19 a.m. ..	Driving
Friday, August 25 ..	Redesdale ..	3 p.m. ..	Driving ..	Driving
Monday, August 21 ..	North Mirboo	2 p.m. ..	1.50 p.m. ..	4.15 p.m.
Tuesday, August 22..	Morwell ..	11 a.m. ..	5.55 p.m. (21st)	11.57 a.m.
Tuesday, August 22..	Traralgon ..	2 p.m. ..	12.10 p.m. ..	9.15 p.m.
Wednesday, August 23	Sale ..	11 a.m. ..	10.20 p.m. (22nd)	1.50 p.m.
Wednesday, August 23	Maffra ..	4.9 p.m. ..	4.9 p.m. ..	11.8 a.m. (24th)
Thursday, August 24	Cowwarr ..	2 p.m. ..	1.15 p.m. ..	5.1 p.m.
Friday, August 25 ..	Trafalgar ..	10.30 a.m.	6.51 p.m. (24th)	11.16 a.m.
Friday, August 25 ..	Moe ..	12 noon ..	11.31 a.m. ..	6.39 p.m.
Monday, August 28 ..	Warragul ..	10.15 a.m.	10.15 a.m. ..	11.5 a.m.
Monday, August 28 ..	Neerim South	3 p.m. ..	12.20 p.m. ..	5.35 p.m.
Tuesday, August 29 ..	Bunyip ..	10 a.m. ..	6.59 a.m. ..	11.25 a.m.
Tuesday, August 29 ..	Pakenham ..	12 noon ..	11.54 a.m. ..	Driving
Tuesday, August 29 ..	Berwick ..	3 p.m. ..	Driving ..	9.19 p.m.
Wednesday, August 30	Cranbourne..	11 a.m. ..	8.2 a.m. ..	6.20 p.m.
Thursday, August 31	Woolamai ..	9.30 a.m...	8.35 p.m. (30th)	10.8 a.m.
Thursday, August 31	Dalyston ..	2 p.m. ..	10.39 a.m. ..	4.12 p.m.
Friday, September 1..	Lang Lang ..	9.15 a.m...	6.16 p.m. (31st)	9.55 a.m.
Friday, September 1..	Dandenong..	11.30 a.m.	11.20 a.m. ..	12.39 p.m.
Monday, August 28 ..	Korumburra	10.30 a.m.	10.27 a.m. ..	Driving
Monday, August 28 ..	Leongatha ..	2.30 p.m...	Driving ..	11.4 a.m. (29th)
Tuesday, August 29 ..	Yarram ..	3.30 p.m...	3.22 p.m. ..	11.25 a.m. (30th)
Wednesday, August 30	Welshpool ..	2 p.m. ..	12.50 p.m. ..	12.50 p.m. (31st)
Thursday, August 31	Foster ..	2.1 p.m. ..	2.1 p.m. ..	2.21 p.m.
Friday, September 1..	Stony Creek	11 a.m. ..	3.19 p.m. (31st)	3.19 p.m.
Monday, August 28 ..	Bacchus Marsh	11 a.m. ..	9.22 a.m. ..	12.59 p.m.
Monday, August 28 ..	Melton ..	2 p.m. ..	1.21 p.m. ..	8.34 p.m.
Tuesday, August 29 ..	Mernda ..	11 a.m. ..	9.40 a.m. ..	1.59 p.m.
Tuesday, August 29 ..	Whittlesea ..	3 p.m. ..	2.25 p.m. ..	8 p.m.
Wednesday, August 30	Lilydale ..	2 p.m. ..	1.53 p.m. ..	5.20 p.m.
Thursday, August 31..	Riddell ..	2 p.m. ..	1.55 p.m. ..	2.51 p.m.
Friday, September 1..	Romsey ..	11 a.m. ..	10.41 a.m. ..	5.20 p.m.
Monday, September 4	Dromana ..	1.30 p.m...	1 p.m. ..	2.20 p.m.
Tuesday, September 5	Cowes ..	1 p.m.		
Wednesday, Sept. 6 ..	Hastings ..	10 a.m. ..	7.12 a.m. ..	11.47 a.m.
Wednesday, Sept. 6 ..	Frankston ..	2 p.m. ..	12.26 p.m. ..	5.36 p.m.
Tuesday, September 5	Orbost ..	2 p.m. ..	8.35 p.m. (4th)..	8.50 a.m. (6th)
Wednesday, Sept. 6 ..	Nowa Nowa	10.30 a.m.	10.14 a.m. ..	Driving
Wednesday, Sept. 6 ..	Buchan ..	3 p.m. ..	Driving ..	Driving
Thursday, September 7	Barinsdale ..	1 p.m. ..	11.20 a.m. ..	2.25 p.m.
Thursday, September 7	Lindenow ..	3 p.m. ..	2.59 p.m. ..	3.1 p.m. (8th)

STALLION PARADES, TIME TABLE—*continued.*

Date.	Parade.	Time.	Officer Arrives.	Officer Departs.
Tuesday, September 5	Omeo ..	3 p.m. ..	3 p.m. ..	6.30 a.m. (6th)
Wednesday, September 6	Bruthen ..	3 p.m. ..	1.30 p.m. ..	9.45 a.m. (7th)
Wednesday, September 20	Sunbury ..	11 a.m. ..	7.44 a.m. ..	1.23 p.m.
	French Island			
Saturday, September 23	Royal Show	1.30 p.m.		
Monday, September 25	Royal Show	9 a.m.		

GRADING OF DAIRY PRODUCE IN CANADA.

The importance of grading dairy produce for sale has for some time been clearly realized in Canada, where a system of grading has been carried out under both Federal and Provincial authorities, as well as by other bodies, both official and unofficial. The object of this grading has in some cases been mainly educational, while in others the aim has been purely commercial, but the system hitherto has been conducted on a voluntary basis and has had no legislative authority behind it.

During the 1920 session of the Canadian Parliament, a resolution calling upon the Government to establish a grading system was introduced into their House of Commons. The unanimous support of the members was accorded, and the Minister of Agriculture, in accepting the principle of the resolution, said that he would be prepared to carry out a scheme of grading for dairy produce as soon as the producers were ready for the introduction of such a system.

It would appear that the dairy producers must have afforded speedy evidence of their desire for Government action in this matter, for an Act, "to regulate the grading of dairy produce," cited as the Dairy Produce Act, was passed by the Canadian Legislature on 4th June, 1921. The Act empowers the Governor in Council to make regulations for the grading of dairy produce intended for export, the articles enumerated being "butter, cheese, and other food products manufactured from milk." It also provides for the appointment of official graders, and for the establishment of standards, definitions, grades and grading stores for dairy produce and the imposition of fees for the grading. The graders are to be empowered to issue certificates as to the quality and proper classification of any dairy produce which they have examined for the purpose. Fines of from 50 to 200 dollars, or imprisonment for a term not exceeding three months, may be imposed for contraventions of the regulations issued under the Act.—*Journal of the Ministry of Agriculture,* England.

WEEDS AND THEIR ERADICATION.

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

(Continued from page 231.)

Perennial Californian Thistle, *Carduus arvenis,* Robs Compositæ.

This most troublesome pest occurs both on arable and grass lands, and unfortunately appears to be becoming more widely spread every year. It is known under several names, of which probably the most common are Creeping Thistle, Canadian Thistle, and Californian Thistle.

It is proclaimed a noxious weed under the Victorian Thistle Act for the whole of Victoria, under the name of *Carduus arvensis*, but the following are synonyms, viz., *Cirsium arvense, Serratula arvensis,* and *Cnicus arvensis.*

This perennial thistle is usually rather a low-growing plant compared with most thistles. Its flower-stems spring from creeping, underground root-stocks or rhizomes of a whitish colour, which spread themselves through the soil in all directions, often to a considerable depth, and if a plant be very carefully dug out of the ground, it will be seen that several apparently individual plants are connected with each other by one running root-stock (Fig. 36). This peculiarity and the great vitality of the root-stocks make it a most difficult weed to eradicate.

The leaves are from 2 to 6 inches long, usually green on both sides. They are narrower than those of most thistles, and are furnished with many hard, sharp-pointed spines.

It is remarkable for being what is known as Diœcious, that is bearing staminate or male flowers on one plant, and pistillate or female flowers on another plant; it is the latter which produce fertile seeds.

The blooms are of a purple colour, each about half-an-inch in diameter (Fig. 37).

This thistle is irregular in its fruiting, some years it will seed freely, but in others hardly at all. This may be largely due to weather conditions, that either assist or retard the pollen grains from the polliniferous anthers reaching the stigmas of the female flowers.

The seed of the Californian Thistle is furnished with a fringe of plumous bristles or awns, called a pappus, which enables the seed to be carried along by the wind.

Apart from the wind, its spread is probably largely due to impure seed, which is such a fertile medium for the dispersal of so many troublesome weeds. Farm produce, threshing machines, and farm implements are other factors in its spread.

Although this thistle will grow in most soils, it revels in those of a rich moist nature. When it is growing amongst crops, care should be taken to prevent its blooming, by cutting or hoeing it out as soon as the flower stems have made their appearance.

Although cultivation is the best method of suppressing Californian Thistle on large areas, the work must be carefully carried out, otherwise more harm than good will be done.

In the first place deep ploughing encourages the roots to penetrate the soil to greater depths. This can be noticed by comparing the

shallow-rooting system of the plant on grass lands with those growing on well-worked arable lands.

Further, the fleshy root-stocks are broken up and distributed by the plough away from the original patch, and under favorable, moist soil conditions most of these small pieces of root are capable of founding a new colony of thistles.

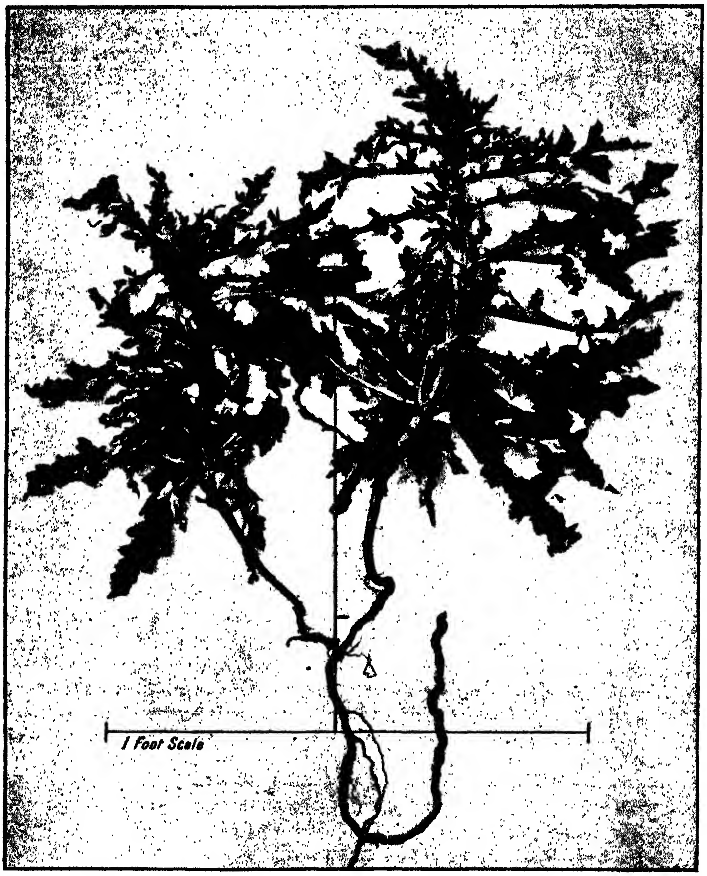


Fig. 36.—Two Distinct Plants of Californian Thistle growing from the same root-stock.

Therefore the eradication of this thistle by cultivation should only be attempted in summer, when the ground is in a very dry condition, so that the small pieces of root-stock will dry out on exposure, instead of developing into fresh plants. Disturbing the soil while it is at all moist will only tend to further spread the trouble.

Fig. 37.—Flowering Stem of Californian Thistle.

The frequent cutting of the Californian Thistle below the surface of the ground weakens, and will ultimately starve the root-stocks; but this work to be effective must be both persistent and thorough.

Summer fallowing is probably the best of all methods to adopt for freeing land of this thistle. Success will largely depend on weather conditions, as rain, in addition to delaying the work, would greatly benefit the thistles. If bare fallows were not desirable owing to the

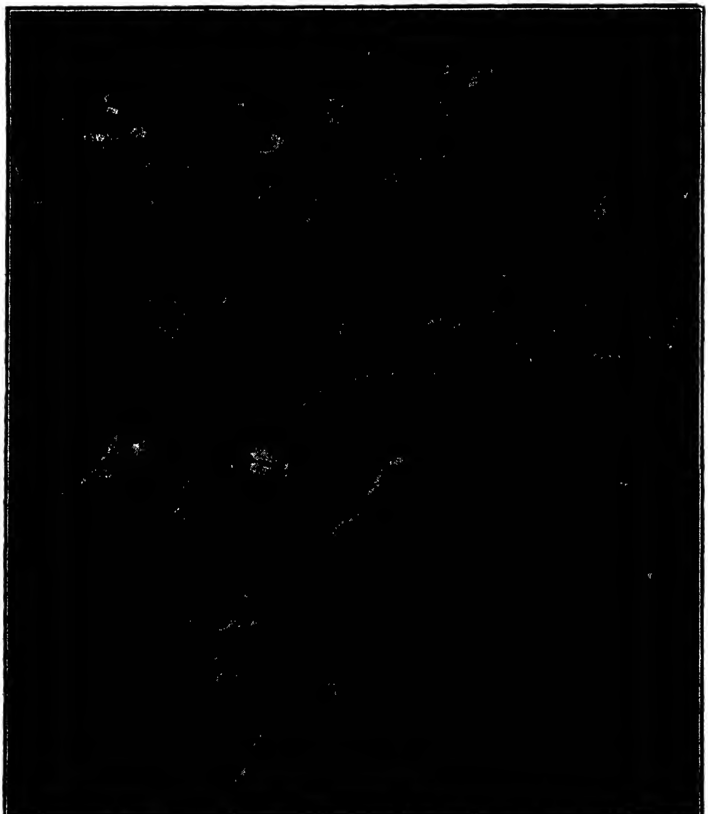


Fig. 38.—Plant of Wild Radish.

loss of use of land for the time being, a cultivated crop, such as potatoes, could be grown. Special attention, however, would have to be paid to the potato rows, otherwise the thistles would spring up, and unless these were destroyed at once, it would become difficult later on to do this work without causing injury to the potato plants.

It is not advisable in the case of small colonies of thistles to destroy them by ploughing, owing to the liability of further spreading the pest. If the patch is a small one, a load of stable manure dumped on

it will smother the plants. Even if not put on thickly enough to prevent the thistles growing through it, the manure would cause the roots to starve to death, providing it were turned over every time the thistle shoots made their appearance, which operation would break the weak tender growths off. Small patches can, of course, be dug out, but the

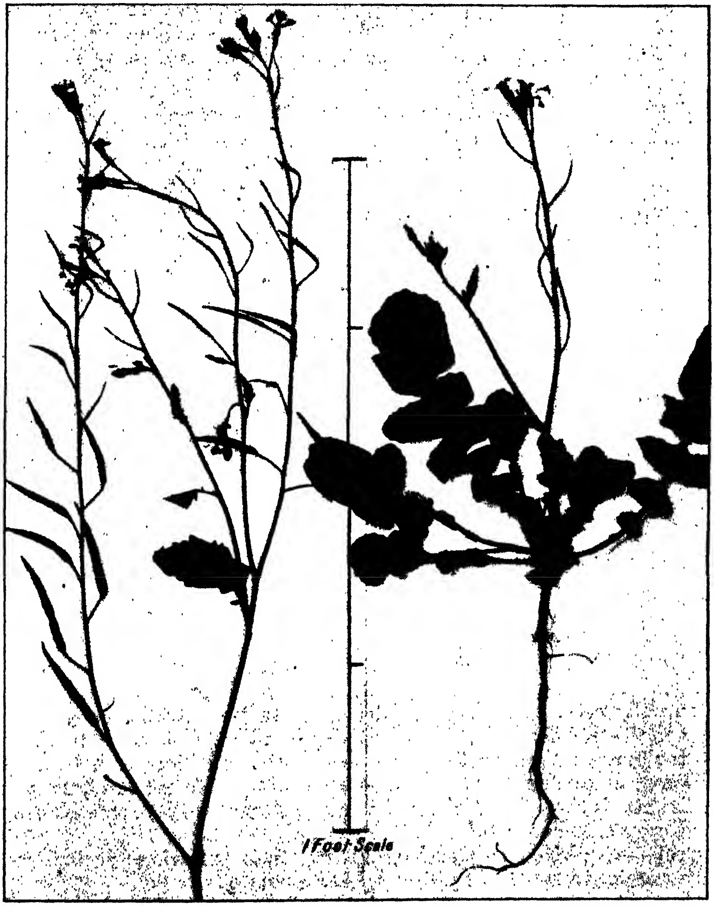


Fig. 39.—Wild Radish showing seed pods and young plants.

necessity for care, if the work is to be effective, cannot be too strongly emphasized.

If arsenical preparations are used, they should be applied when the thistles are about half grown, and again when the new growths are about 5 inches high. This treatment will, in all probability, have to be repeated from three to five times before all the root-stocks are starved.

With large infestations the land should be ploughed three or four times at varying depths during the summer months for the purpose of bringing the roots to the surface and exposing them to the sun. In the intervals between the ploughing, the cultivator should be kept going, so that the formation of leaf-growth by this plant will be made impossible.

One fact that must not be lost sight of is that Californian Thistle is capable of spreading itself even if it is not allowed to produce seed. Indeed, the seed appears to be short-lived in the soil, only lasting for a year or two.

Wild Radish or Jointed Charlock, *Raphanus Raphanistrum*, L. Cruciferæ.

Among the cruciferæ plants, of which the Wild Radish is one, are some valuable food plants, the most familiar ones being the various kinds of Cabbage, Radish, and Turnips.

The Wild Radish (Fig. 38) is a common pest on cultivated land, and, if allowed to run to seed, rapidly fouls the ground. It is an annual or biennial, having almost glabrous leaves, the lower or basal ones being lyrate, that is pinnatifid, with the terminal lobe much larger than the other segments, the latter decreasing in size towards the petiole. The flowers are either straw-coloured or white, veined with purple, but it is the distinctive form of its fruit pods that makes this plant so easy of recognition. These pods when ripe are much constricted between the seeds, the latter being without partitions, and this gives them a knotted or bead-like appearance. In Fig. 39 these constrictions in the pods are not well shown; this is owing to the fact that the seed vessels were immature when the plant was photographed.

The old saying "One year's seeding makes seven years' weeding" applies with great force to the Wild Radish. If previous cultivations on land infested by radish have buried its seeds, seedlings will continue to make their appearance for a long time afterwards, whenever the soil is again broken up by cultivation.

For this reason, on land that has been fouled with Wild Radish, the buried seeds should be brought to the surface by frequent stirrings, so that by the influence of air, light, and moisture, they may be encouraged to germinate. Bare fallows, with frequent harrowings, would then destroy the seedlings. The depth of cultivation should be varied, in order that seeds buried at different depths may be brought to the surface for germination, until all the seed in the soil becomes exhausted.

Cereal crops should not be grown on badly infested land, as a crop of this description would allow the radish to mature its seeds before the cereal crop was harvested.

Crops requiring cultivation during their growing period would greatly assist in the freeing of land from this pest.

On land where the great mistake has been made of having ploughed in matured plants of radish carrying ripe seed, it will probably take a few years to free the ground. Even on land where cleaning crops are grown, such as potatoes, it will be necessary to exercise constant vigilance to see that no radish plants escape the cultural operations and mature their seeds.

Wild Radish is proclaimed a noxious weed for the State of Victoria under the Thistle Act.

(*To be continued.*)

GOROKE CROP AND FALLOW COMPETITIONS, 1921.

Report of the Judge, I. M. Tulloh, Field Officer, Department of Agriculture.

Situated on the fringe of the Wimmera, and separated from the fertile plains by several strips of desert country, the Goroke and Minimay districts form the western outposts of the Wimmera wheat belt.

The country is undulating, and in many cases still heavily timbered, and there is probably no other district in Victoria where such a variety of soils is met with. The rising ground is invariably light, and may be either loose sand or the light red soil which forms the bulk of the cultivated land of the district. The flats contain heavy black soil, and many now under cultivation compare favorably with the heavy soil of the "Plains."

Mr. J. E. Molloy's Crop of Federation.

Along low-lying parts run a chain of swamps, which are linked up by water-courses during the winter months. In many cases the water spreads over large areas of flat country, and for this reason, a considerable portion of this heavy land is not available for cultivation. A comprehensive drainage system, though a costly undertaking, would prove of immense benefit to many district wheat-growers.

It must be admitted that wheat-growing here has not yet been brought to the high standard of the "Plains," due mainly to local difficulties which have been discussed in previous reports.

It is generally recognised, however, that the methods are rapidly improving, and for this much credit is deservedly given to the local crop and fallow competitors, of which the one now under notice is the fifth.

A spirit of friendly rivalry has sprung up among competitors, and so long as this continues, the competitions will play a big part in still further advancing the wheat-growing industry in the district; an extra

working of the fallow, an increase in seed and manure, the use of selected seed, &c., applied with the object of doing better than the next man, must show this effect in a higher average yield per acre.

The number of entries this year (28) shows a substantial increase, and is ten more than last season.

The competition is divided into two sections for *each* heavy and light soils, *i.e.,* Fallow, 1920; Crop, 1921; Best Crop, 1921.

SECTION I.—HEAVY SOIL.

Aggregate of points for fallow, 1920, and crop, 1921.

—	Fallow 1920.	Crop 1921.					Crop Total.	Total.
		Yield.	Purity.	Freedom from Disease.	Freedom from Weeds.	Evenness.		
Maximum Points	**100**	**40**	**20**	**15**	**15**	**10**	**100**	**200**
H. C. Block (*a*)	100	32	19	13	11	8	**83**	**183**
T. M. Molloy	93	32	17	12	14	9	**84**	**177**
J. E. Molloy	90	30	20	13	13	9	**85**	**175**
C. B. Block	92	35	17	9	11	8	**80**	**172**
H. C. Block (*b*)	91	27	19	12	10	6	**74**	**165**
W. H. Stehn	84	34	17	11	11	7	**80**	**164**
F. Hinch	74	34	17	14	13	8	**86**	**160**
F. O. Robertson	75	31	19	14	13	7	**84**	**159**
P. Molloy	85	26	19	13	10	5	**73**	**158**
Caldow Bros.	74	29	17	15	13	7	**81**	**155**
Delaney Bros.	71	28	17	13	11	6	**75**	**146**

It will be seen that the winner, Mr. H. C. Block, owes his success to his splendid fallow, which was awarded 100 points last year. The crop, also, was a well-grown one, but rather thin, and would have benefited by a heavier application of both seed and manure. The variety was Federation, and was very free from foreign varieties. It contained a fair sprinkling of weeds, mainly wild oats.

The land had been ploughed in July, spring-toothed at the end of August, and lightly disced late in October. It was spring-toothed before drilling, when 57 lbs. of seed and 80 lbs. of superphosphate were sown per acre at the latter end of June, after which it was harrowed.

Mr. T. M. Molloy's crop was grown on the crown of a rise, where the soil was much lighter than that of the winner. It was red soil, but more friable and fertile than the ordinary light soil of the district. This crop was very even, dense, and well-headed. There was a moderate number of foreign varieties present. The land was ploughed during July and August, scarified early in October, and harrowed three weeks later. It was scarified in front of the drill, and harrowed immediately after sowing. Seventy-five lbs. of seed and 112 lbs. of manure were sown per acre.

Mr. J. E. Molloy's crop received similar treatment. It was grown on the lower edges of a slope, and included a portion of heavy soil, on which the crop was exceptionally dense. The average yield, however. was reduced by the lighter crop on the remainder, which had been thinned somewhat by the soakage from the slopes. This crop had been

sown with very pure seed, and was practically free from foreign varieties.

Mr. C. D. Block had a very fine crop. Unfortunately, it had been sown with unpickled seed, and was infected with "ball smut." It was put in with the stump-jump cultivator and drill during the last week of June, sowing 70 lbs. of seed and 112 lbs. of manure per acre, and was harrowed immediately after. This crop received the highest number of points for yield.

Section II.—Best Crop of 50 Acres on "Heavy Soils."

—	Yield.	Purity.	Freedom from Disease.	Freedom from Weeds.	Evenness.	Total.
Maximum Points	**40**	**20**	**15**	**15**	**10**	**100**
F. Hinch	34	17	14	13	8	**86**
J. E. Molloy	30	20	13	13	9	**85**
F. O. Robertson	31	19	14	13	7	**84**
H. C. Block	32	19	13	11	8	**83**
W. H. Stehn	34	17	11	11	7	**80**

All the crops in this section appear in Section I.

The winning crop, that of Mr. F. Hinch, promised to yield well. It was grown on new ground, which was exceedingly crabholey, and ploughed up in a very rough state. Though the rainfall during the winter months was well up to the average, the fine spells between the wet periods prevented the lodging of water, so that the depressions, as well as the banks, were well covered with a thick and heavy crop. A drain made through this paddock also assisted largely in carrying off surplus water during the winter. Fallowing had been done during July, August, and September. This work was delayed owing to water lying in the crabholes. It was spring-toothed early in October. Levelling had been commenced in spring (using a "smoodger)", but owing to pressure of other work only a small area was worked. The land was spring-toothed before drilling, which was commenced during the last week in May, and completed early in June. Seventy-five lbs. of seed and 90 lbs. of manure were sown per acre. Having been sown early, the crop (Federation) was tall, and showed a tendency to lodge in heavy patches. There was a sprinkling of foreign varieties present, but, except for occasional plants of "spear" thistle, it contained comparatively few weeds.

The crop of Mr. J. E. Molloy, which has been discussed in Section I., must be considered as probably the most creditable one in this section. It has been mentioned that it was grown on much lighter ground than those of the other competitors, yet it has been placed only one point behind the winning crop. Mr. Molloy attributes the success of this crop to the thorough scarifying given before sowing, and to the liberal application of seed and manure.

Mr. Robertson's crop received similar treatment to Mr. Hinch's, which it adjoined. It consisted of Federation and Minister. The Federation was a strongly-grown crop, but was inclined to be patchy. The

Minister was a thick crop, but had gone down badly. It should yield well, provided that it can be all gathered at harvest time.

SECTION III.—LIGHT SOILS.

Aggregate of points for fallow, 1920, crop, 1921.

—	Fallow 1920.	Crop 1921.					Crop Total.	Total.
		Yield.	Purity.	Freedom from Disease.	Freedom from Weeds.	Evenness.		
Maximum Points ..	**100**	**40**	**20**	**15**	**15**	**10**	**100**	**200**
Caldow Bros.	87	29	17	14	13	8	**81**	**168**
T. Delaney	87	28	17	13	13	8	**79**	**166**
G. McPhee	90	30	14	10	13	9	**76**	**166**
E. Cross	87	21	19	15	14	9	**78**	**165**
H. C. Block (a)	91	19	19	13	13	6	**70**	**161**
F. Edwards	95	16	16	14	11	6	**63**	**158**
H. C. Block (b)	95	9	18	14	12	4	**57**	**152**

Mr. C. D. Block building a Table-top Waggon at his Farm.

Messrs. Caldow Brothers' crop was of Penny and College Purple Straw; the Penny appeared to be much the heavier crop. This had been grown on new ground, and had been well seeded and heavily manured—60 lbs. of seed and 112 lbs. of manure per acre. The crop was tall and dense for this class of soil, and was fairly free from strangers. The land was ploughed in July, scarified in October, and again after heavy rain at the end of December. It was spring-toothed in front of the drill, and was sown during the latter end of April.

Mr. T. Delaney's crop was also a very fine one. It was dense and well grown, fairly free from strangers, and contained few weeds. The land was fallowed during June and July, and was spring-toothed in

September, and the crop put in with the combined drill early in May. Seventy lbs. of seed and 112 lbs. of manure were sown per acre. A part of the fallow which had not been cultivated in spring appeared to carry a considerably lighter crop than the remainder.

Mr. G. McPhee's crop was a heavy one, and was awarded the highest points for yield in this section. It was growing in a loamy bank on the edge of a swamp. It had been well put in. A portion of the land on which cape weed had sprouted was skim-ploughed early in April. It was all cultivated at the end of that month, and again in front of the drill a fortnight later. Fifty lbs. of seed and 70 lbs. of manure were sown per acre. The crop, however, was marred to a considerable extent by the presence of foreign varieties and barley plants, and it was also infected with "ball smut."

Mr. E. Cross had a very attractive crop, which was grown on very light soil. It was a light crop, but scored well in points under the various headings.

Mr. H. C. Block's two crops, and that of Mr. Edwards, suffered from water-logging, and were very much thinned out.

SECTION IV.—BEST CROP OF 50 ACRES ON LIGHT SOIL.

—	Yield.	Purity.	Freedom from Disease.	Freedom from Weeds.	Evenness.	Total.
Maximum Points	**40**	**20**	**15**	**15**	**10**	**100**
A. Richards	28	20	13	13	8	**82**
Caldow Bros.	29	17	14	13	8	**81**
C. D. Block	26	18	14	14	8	**80**
H. C. Block	19	19	13	13	6	**70**

Mr. Richards' winning crop of Federation was sown from seed obtained from Longerenong College, part last year, and part the year before. It was true to type, and contained no foreign varieties. The ground was ploughed in August; it was harrowed in October, and disced at the end of March. The crop was put in early in May, with the spring-tooth working in front of the drill, and was harrowed immediately after. Seventy-five lbs. of seed and one bag of superphosphate were sown per acre. Though grown on buckshot country, this crop was very dense, and well-headed. The average yield, however, was reduced owing to one paddock having a number of lighter patches, where water had lain during the winter.

Mr. Richards considers that the heavy seeding and the very liberal manuring stood to his crop, and he intends applying similar quantities when sowing next year.

Mr. C. D. Block's crop was grown on light buckshot country also. The land had been cropped in 1920, but owing to the heavy rains that year it had been badly water-logged, and a very poor crop resulted,

although it had been sown twice—40 lbs of seed and 112 lbs. of manure per acre being used on each occasion. The land was ploughed up again at the end of April, drilled immediately, and then harrowed. Seventy lbs. of seed and 112 lbs. of manure were sown per acre. As the crop the previous year had been ruined through water-logging, it can be reasonably assumed that the heavy rains last winter had also affected the crop to a considerable extent. The good seeding (70 lbs. per acre) and the heavy manuring, however, stood well to the crop, and it had developed nicely. It was not as dense as that of either Mr. Richards or Messrs. Caldow Brothers, but was even, and comparatively free from weeds. Had this crop been given better drainage, it would have grown more strongly, and been much denser.

The crops of Messrs. Caldow Brothers and H. C. Block have been discussed in Section I.

Heavy Soils.

The exceptionally favorable season resulted in all the crops being of a fairly high standard. The quality of the heavy land in the district is equal to much of that on which fifteen-bag crops were grown on the "Plains" this year.

In making a comparison, however, between the crops exhibited in this competition and those inspected on heavy soils in other competitions throughout the Wimmera, it must be admitted that there is a distinct difference in favour of the latter, and there must be a definite reason for it.

Summer fallowing has become a routine practice on the plains. During the last two seasons, I have not seen any crop grown in this district on summer fallow. It is noticed that frequently the fallowing is not finished till the end of August, or even late in September. Ploughing so late in the season must result in large losses of moisture through evaporation, while it gives little opportunity for the germination and destruction of weeds during spring; it prevents good consolidation below, and the forming of an effective mellow mulch.

On the "Plains," summer fallowing has come to stay. The benefits from the practice have been amply illustrated by the winning crops in the various Wimmera competitions in recent years.

Apart from the actual gain to the crop itself, it means a better distribution of the work, and any land not turned over before seeding can easily be dealt with before the end of the winter. To get the best results from the fallow, it is necessary that it should be worked deeply and thoroughly, in early spring, so that weeds will be effectively dealt with; the scarifier is the most suitable implement for this purpose; the combined drill or spring-tooth can be used for lighter workings later in the season. These later workings should be given before weeds get too strong a hold, so that deep working at this time of the year will not be necessary. Harrowing immediately after summer rains conserves additional moisture, and brings the fallow into nice mellow condition.

It is noticed that the later sowing on the heavy soils, with heavier applications of seed and manure, is being adopted. This is a practice

that has been definitely proved successful, and over a number of years has increased the average yield up to 4 bushels per acre. Although the winning crop, that of Mr. Hinch, was sown early, it must be remembered that this was on new ground; it had been liberally seeded and manured, and the season was one of those which occasionally occur, when the difference between yields from early and late sowing is not great.

Thorough preparation of the seed bed is necessary. The best results are gained when two germinations of weeds are destroyed after the autumn rains. These usually occur during the latter end of May. A scarifying is given a fortnight or so later; then, towards the end of June, sowing is commenced, scarifying again in front of the drill, or sowing with the combined drill. A harrowing a day or two afterwards prevents any weeds from taking root in the moist soil.

Light Soils.

In the past, it was considered that light seeding and manuring was necessary for the light country. The crops were invariably light. Recent experiments have determined that this class of soil can be heavily manured with advantage, and that it pays to put in a liberal quantity of seed. By this means, the crops, though not as heavy as those on black soils, have been greatly increased in density.

A notable feature of the crops this season was the failure of those grown in fallows, which were awarded the highest points. This was due to one cause—"water-logging." It has been generally recognised that crops on light soils are favoured by a moderate or even light rainfall. The crops of Messrs. Caldow Brothers and Mr. H. D. Walker last year, and of Messrs. McPhee, Richards, Delaney, and Caldow Brothers this year, show that equally good, if not better, crops can be grown during a wet season. All of these crops were grown on sloping land, which was afforded fair natural drainage.

The clay sub-soil, which is found from 3 inches to 9 inches below the surface, holds the water in a wet season, and unless this is drained off, the whole of the surface soil becomes water-logged, with fatal results to the crop. This can be greatly overcome by ploughing in lands not more than a chain in width, and even less where practicable. Care should be taken that the furrows are not filled in during future workings. Mr. Walker's paddock was treated in this manner last year, with very beneficial results.

In conclusion, I desire to thank the officers of the Society, the Secretary (Mr. D. Vorwerg), and the competitors for the thoughtful arrangements made in connexion with the judging.

CROP AND FALLOW COMPETITION, DONALD, 1921.

Report and Awards of the Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer.

Herewith I am forwarding you my report and awards as judge of the Crop and Fallow Competition recently conducted by your society.

The interest taken in the competition in this the initial year should prove distinctly encouraging to the Donald Agricultural Society, whose object is to improve the local methods of crop production and to stimulate greater interest in farming generally.

In all twenty-four entries were inspected. They were distributed throughout the rich wheat-growing districts of Donald, Laen, Cope Cope, and Swanwater West.

The District.

Donald is interesting in that it stands practically at the head of a vast belt of red loam, which stretches east towards Charlton and Boort, and includes the Goulburn Valley. The black clay loams of the Wimmera, which trend in a general easterly direction from Rupanyup, Murtoa, Horsham, and Dimboola, definitely cease at Laen and Rich Avon to the west of Donald. The soil transition is accompanied by a characteristic increase in the proportion of buloke timber present. At Donald box timber occurs mainly on a few low-lying flats, where the soil is still black. Near Donald, too, one meets the first of those sandy rises clothed with Murray pine, which are a characteristic feature of the red loams and the Goulburn Valley.

Naturally the soil change has led to some differentiation in farming methods from those of the Wimmera. The land is more frequently spelled in grass than that further west, and as a rule lighter sowings of wheat and manure are given. Another feature is that many farmers still perform the major portion of the cultivation of the fallows with the skim plough, though the scarifier has a vogue on any black land. In a number of instances the wheat is sown with the "box plough," an implement consisting of a patent seed drill attached to a skim plough. Federation wheat is the main variety grown, but Penny is also popular.

On the whole the crops appeared to be somewhat lighter than those in the Wimmera country to the west. For the present it is difficult to say whether the difference is due to season, soil, or to method. But if the competitions are continued for a few years, it ought to be possible to speak with definiteness. For the present it must be accepted that a crop produced in the Laen district by the use of approved Wimmera methods was the most successful this year. Whether those methods will give the same results in the future remains to be seen. In view of the soil differences that exist, it might be advisable for competition purposes in the future to separate the red land from the black.

The scale of points adopted in judging was that now standardized throughout the Wimmera. The marks are allotted so as to place a premium on good farming. In the crop section 35 per cent. of the award goes for yield, 20 per cent for trueness of the wheat to its type, and 15 per cent. each for such important desiderata as absence of

Residence of Mr. C. Harcoam, Donald.

A Comfortable Farm Home (Mr. H. S. Pope's, Donald).

weeds, absence of disease, and the general regular character of the crop. Of course, it may happen occasionally that the heaviest crop is not placed first, because of some disability on the score of disease, &c., but it is evident that the winning crop is always one produced by good farming methods.

Results.—*Section* 1.

For Best Growing Wheat Crop, not less than 50 Acres.

The winner of this section proved to be Mr. R. A. Adams, of Laen. The crop—Federation—was grown on a fine black flat, which had been well worked and liberally manured. In this crop the heads were densely packed. It was level and free from undergrowth or wild oats. The yield should have been heavy. Points were deducted because of the presence of a few foreign heads. The crop was surprisingly regular throughout.

The land was skim-ploughed in July, 1920, in the spring (September); it was scarified and harrowed, and then re-scarified in October. After harvest it was harrowed in March, scarified in April and again in June. Sowing then took place, the seed being applied at the rate

Portion of Winning Crop—Mr. R. A. Adams'.

of 66 lbs. per acre, with 112 lbs. of superphosphate. A light harrowing was given after the drill. Important considerations in raising prolific crops on land of this class are thorough cultivation to shallow depth, suppression of the weeds, late seeding, and the use of from 65 to 75 lbs. of seed with about 1 cwt. of superphosphate.

The entry awarded second place is that of Mr. John T. Dickerson. Fifty acres of Federation were shown. The bulk of the paddock was black soil, but there were red patches. This crop showed some unevenness, but scored well because it was practically pure and there were no weeds and little disease. Some of the other crops, however, were heavier.

The fallow on which this crop was grown was prepared as follows:—In March it was thoroughly fallowed with the skim plough. In July a further skim ploughing was given. Subsequently sheep were given access to the paddock. The scarifier and harrows were used in the spring and in the autumn. Towards the end of May the land was re-scarified and sown at the beginning of June with seed at the rate of 60 lbs. per acre, and with 90 lbs. of superphosphate.

Mr. A. Black showed an exceptionally heavy crop of Federation, which scored well in all respects except under the heading of freedom from disease. The crop was situated on rising ground of a rich loamy character. The land was summer-fallowed with a skim plough in March. In July and August it was also skim-ploughed and again in September. The fallow was then left until March, when it was harrowed after rain. The seed was sown without further cultivation with a "box" plough at the end of May and the beginning of June. Eighty pounds of seed and 80 lbs. of superphosphate were used. It will be noted that most of the cultivation was done with the skim plough.

The remaining crops were on the whole lighter in yield than the three mentioned above. In some cases they lost points because of numerous foreign heads present, and in others because of smutted heads, or again "take-all."

Heavy Crop of Penny Wheat (Mr. G. Coates', Donald).

DETAILS.—SECTION I.—BEST GROWING WHEAT CROP, NOT LESS THAN 50 ACRES.

Name.	Yield.	Trueness to Type.	Absence of Disease.	Absence of Weeds.	Evenness.	Total.
Maximum points	**35**	**20**	**15**	**15**	**15**	**100**
R. A. Adams	35	15	15	15	15	95
J. T. Dickerson	30	18	13	15	13	89
A. Black	33	17	8	14	15	87
H. S. Pope	30	16	11	14	13	84
Deane Wells	27	17	11	13	15	83
H. Hancock	31	16	8	13	15	83
J. Coates	26	17	13	12	13	81
G. A. Pope	27	14	13	14	13	81
C. Harcoam	31	14	9	11	14	79
Clifford Bros.	24	17	6	13	13	73
L. V. Dunn	25	16	10	11	11	73

Results.—Section 2.

For the Best Fallowed Land, not less than 50 Acres.

In judging the fallow some difficulty was experienced in making fair comparisons between land of such varying classes as, say, red clays and friable black loams. In future it would facilitate the work if the black land were placed in a class by itself. The scale of points used for the fallows, like that of the crops, has been framed with the regard for encouraging best farming practice; 25 per cent. of the award is given for the character of the mulch, *i.e.*, the loose earth covering the fallow; 25 per cent. for the amount of moisture stored in the fallow, 25 per cent. for the absence of deleterious weeds, and the final 25 per cent. for cultivation.

The art of fallowing the friable Wimmera soils consists largely in conserving moisture from the preceding year for the current crop, as well as in the destruction of weeds and in the provision of cover for the seed. To conserve moisture effectively the surface must be kept in a loose condition to a depth of 2 or 3 inches. More than that,

Judging the Winning Fallow (Mr. R. A. Adams', Donald).

judgment and skill must be exercised in the use of the various cultivation implements. If the work is not done while the soil is in a moist condition, a mulch of unsatisfactory texture results, and if the depth of the implements is not carefully regulated the mulch may be too deep at one point and too shallow at another. The greatest care must be taken to use the lightest implement that will cope with the work. Heavy implements, especially in dry seasons, tend to stir the land too deeply, hence a firmly consolidated seed bed under the loose surface is difficult to maintain. By judicious sheeping and cultivation when the weeds are young, this may be avoided.

The ideal fallow on friable land in the Wimmera is one where the seed bed is firm and moist and level as a billiard table. It should be overlain with some 2 to 3 inches of loose mellow soil. This is the class of fallow, other things being equal, which has given the heaviest yields in the Wimmera during the past five or six years.

DETAILS.

Mr. R. A. Adams, who won the crop section, was also placed first with his fallow. The paddock shown consisted of 54 acres of fine black soil. The mulch was of mellow texture, though somewhat shallow. The maximum amount of moisture had been conserved, though, of course, recent rains had been responsible for some of it. There was a complete absence of weeds, and the cultivation had been effectively done. The seed bed was moist, firm, and level throughout the field. The following treatment was given:—The paddock was summer-fallowed early in April, 1921, with a skim plough. In July the paddock was scarified and then harrowed. These operations were repeated in September and again in October. Mr. Adams once depended entirely on the skim plough and harrows. Four years ago he adopted the scarifier and the methods its use permits. He estimates his yields to be considerably improved. He places them at from two to three bags to the acre better.

The fallow allotted second place was that of Mr. H. Hancock, also of Laen. The land was black loam. The moisture content was high, the mulch effective, though shallow, and in particular a well-consolidated level seed bed, showing skilful cultivation, was in evidence. This was winter fallow, ploughed with a set plough in July and then harrowed, and the harrowing was repeated in August. In September the scarifier was resorted to, and then the harrows. Finally, at the end of October the land was re-scarified and then harrowed.

The paddock of red loam submitted by Mr. G. Coates was almost equally good. Points were, however, lost on account of the slightly uneven character of the seed bed, due to the implements working at irregular depths. This paddock was thoroughly ploughed in March, 1921, to a depth of from 4 to 4½ inches. In June it was skim-ploughed, in mid-September spring-toothed, and then it was harrowed in October and again in November.

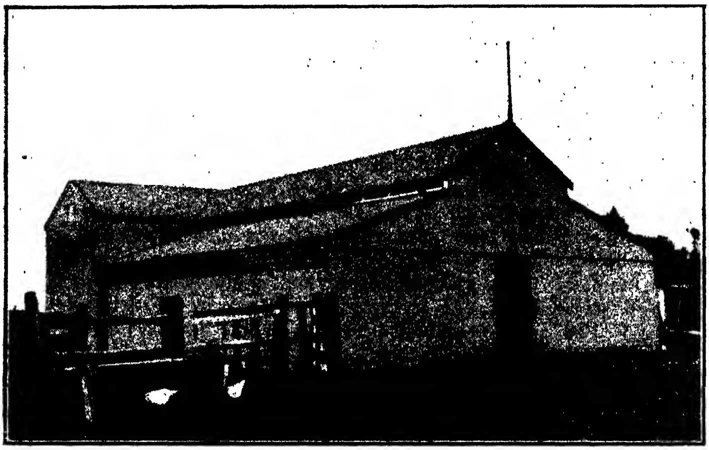
Excellent fallows were also submitted by Messrs. J. T. Dickerson, S. Coates, T. C. Leslie, and W. R. Pope. An interesting paddock was shown by Mr. E. Baddack. The soil was a deep sandy loam. The practice is to plough it very deeply, and then lightly skim plough when weeds appear. Good crops are grown.

DETAILS.—SECTION II.—FOR BEST FALLOWED LAND, NOT LESS THAN 50 ACRES.

Name.	Soil Type.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Maximum points ..	.. ..	**25**	**25**	**25**	**27**	**100**
R. A. Adams ..	Black clay loam ..	25	24	25	25	99
H. Hancock ..	Black clay loam ..	25	24	24	25	98
G. Coates ..	Red loam	25	24	24	23	96
J. T. Dickerson ..	Black clay loam ..	25	25	22	24	96
S. Coates ..	Grey flat	25	24	25	21	95
T. C. Leslie ..	Black loam	25	20	25	25	95
W. R. Pope ..	Black flat	22	23	25	24	94
D. Wells ..	Black clay loam ..	24	23	20	25	92
E. Baddack ..	Deep sandy loam ..	24	21	22	25	92
A. Black ..	Reddish loam	25	23	21	22	91
H. Pope ..	Black loam, red patches ..	24	22	25	20	91
G. A. Pope ..	Red clay, black patches ..	23	21	22	22	88
C. Harcoam ..	Red clay	20	21	23	21	85

Manuring the Wheat Crop.

In recent years there has been a remarkable increase in the amount of superphosphate used per acre by Wimmera farmers. They find the heavier dressings pay. That experience is backed up by the results on the Government experimental plots. The nearest experimental plot to Donald is that at Warracknabeal on the Mallee fringe. The soil is a red sandy loam not unlike much of that at Donald. For a period of ten years these experiments have been in progress. The results show that with Federation wheat 1 cwt. of superphosphate produced about 2 bushels more wheat per acre than did ½ cwt. Valuing the wheat at 4s. a bushel and the manure at 6s. 6d. per cwt., the increased profit per acre after paying for the extra manure is 4s. 4d. In addition, when the heavy manured land is rested in grass, there is a decided improvement in the number of stock that can be carried.



Convenient Type of Stable—one of three built by Messrs. Pope Brothers.

(Plans and specifications of this building will be included in the next issue of this Journal.)

Wheat Diseases.

The crops at Donald this year were exceptionally free from take-all and black rust. Not so, however, ball smut, which was widespread. It should be remembered that ball smut takes a far greater toll of the crop than is apparent to the eye at harvest. Numbers of plants are killed earlier in the season, and others lose in vigour.

The presence of smutted heads in a crop is certain proof of faulty pickling. Since the smut fungus cannot live in soil, the only means by which the crop may be infected is by the use of infected seed. Pickling with a fungicide will kill the smut without materially affecting the wheat; but care must be taken to make the pickling solution up to the exact strength, otherwise either the smut will not be killed, or on the other hand, the grain may be unduly injured.

If formalin is used the correct strength is 1 lb. of formalin to 40 gallons of water, with immersion for three minutes; with bluestone the standard strength is 1½ lbs. to 10 gallons of water, with immersion for three minutes. Unless the wheat is tipped out of the butts into the pickle, and any smut present carefully skimmed off, there is always a chance of re-smutting the wheat, even though it has been well pickled. All bags should be pickled, and each lot of the pickle should be made up in the same way. Where these precautions are faithfully taken there will be no smut.

Seed Wheat.

Judging by the number of strengers seen in most of the crops at Donald, it is evident that some of the seed has been in the district for a considerable time. It pays to regularly obtain seed which has been subjected to improvement by selection. Compared with ordinary Federation, hand selected Federation at Longerenong College is much more prolific. A bag or two should be secured each year, and the farm wheat bred up from that.

In conclusion, I beg to thank the secretary, Mr. J. B. Duncan, and the president, Mr. H. Pope, and other officers of the society for their help and consideration during the judging.

CAUSE OF SECOND GROWTH IN POTATOES

The effects of continued drought on potatoes are generally most evident in the maturing of the tubers; these remain small and ripen prematurely, those that attain an approximately normal size being apt to show uncommonly large formations of secondary tubers. The explanation of this latter phenomenon is that after prolonged foliage development, the underground eyes of the potato plant develop tubers which store the already manufactured starch. The drier the summer the more quickly the tuber ripens. The cells (except the youngest about the eyes) gradually lose the ability to increase in size to any extent. If now, after drought, rain falls, the young cells around the eye, with their still elastic walls, begin to grow, and a secondary tuber, superimposed on the primary one, results.—*Agricultural Gazette,* New South Wales.

WORLD'S POULTRY CONGRESS.

(Continued from page 244.)

A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

The Relation of Carotinoid Pigments to Poultry.

Professor H. L. Kempster, of Missouri University, designated carotinoid pigments as belonging to two classes—*carotin*, which is the principal yellow pigment found in carrots, and *xanthophyll*, the principal yellow found in yellow maize.

A test was made on hens fed on the following rations: (*a*) rich in xanthophyll and low in carotin; (*b*) rich in carotin and low in xanthophyll; (*c*) low in both carotin and xanthophyll. The results showed no difference between (*b*) and (*c*), but the rich xanthophyll ration gave highly coloured yolks; the principal yellow pigment used by the fowl is therefore probably xanthophyll. Professor Kempster noted a more than casual relation between the simultaneous presence of carotinoids and fat soluble vitamine in butter fat and the leafy parts of green plants, and the absence of carotinoids and the fat soluble vitamine in lard. Yellow maize is richer in fat soluble vitamine than white maize.

These facts seem to indicate a relation between carotinoid pigments and vitamines, although cartoinoid pigments are found in vegetable oils (cotton seed oil) with no vitamine presence. It has been generally noted that in hens which naturally carry yellow pigmentation, a positive correlation exists between pale shanks, ear lobes, beak, &c., and more or less heavy egg production. The theory advanced by Professor Kempster is that the fading of the yellow pigmentation as a result of fecundity is not due to the subtraction of pigmented fats from these parts, but that the normal appearance of xanthophyll in yellow fleshed breeds is the result of a natural excretion, and that fecundity merely deflects this path of excretion to the egg yolk, thereby removing the source of pigment to the visible parts of the fowl.

The result is that the pigment found in the skin at the outset of fecundity is gradually excreted towards the epidermis, where it either becomes oxidized (decolourized), or wears away as the result of structural changes in the epidermis.

Two full-grown white Leghorn cockerels, reared on a carotinoid free (colourless) ration showed complete absence of pigment in the skin. They were then fed a ration with a high proportion of yellow maize. In seventy-two hours yellow colour began to appear, and on the fifth day the shanks and beak showed yellow. The next day it was visible in ear lobes, eye ring, &c. Later, one of these birds was again fed on carotinoid free ration, and after ninety days the beak, ear lobes, comb, skin, &c., were entirely colourless. According to the hypothesis previously advanced, if fecundity deflects the path of the excretion of the xanthophyll from the skin to the ovaries, it is to be expected that no restoration can be effected as long as fecundity continues. In proof of this, hens which were laying, and had continuously been fed on a xanthophyll free ration were subsequently fed rations rich in xanthophyll. After thirty days' feeding of yellow maize in one case, and green stuff in another, the egg yolks were highly coloured. The conclusions drawn from experiments were:—

1. Xanthophyll is the only carotinoid pigment used by the fowl.
2. Carotinoid pigments have no important bearing on growth, fecundity, or reproduction.

3. The fading of yellow pigment is due to the fact that fecundity deflects the excretion to the egg yolk.

4. It is impossible to restore xanthophyll to the skin whilst fecundity lasts.

5. Fading of ear lobes, beak, &c., is an index of fecundity only, not of heavy egg laying.

6. The principal sources of xanthophyll are green feed and yellow corn.

The Irish Egg.

ITS COLLECTION, MARKETING, AND TRANSPORT.

Mr. P. J. O'Neill pointed out that Ireland, for her size and population, came first as regards export of eggs. Prior to the war, Ireland exported 8,000,000 long hundreds (ten dozen) eggs, Russia 6,000.000, and Denmark 4,000,000 to Great Britain. This is of interest because the population of Ireland is about equal to that of Australia.

In 1913, the year before the war, 40 per cent. of all eggs imported into Great Britain came from Ireland, which latter country, in 1918, exported over £18,000,000 of poultry eggs.

This remarkable success is largely due to the co-operative societies which collect eggs by motors, the organization of these societies being chiefly the work of the Irish Agricultural Organization Society. Eggs are all tested, and those of inferior quality, yet suitable for early consumption, are packed separately, and branded "ungraded."

The Department of Agriculture for Ireland graded the 2-oz. egg (15 lbs. per 120) as "selected," and eggs weighing 16 lbs. per 120 "extra selected," and there is also a third class "ungraded" for eggs of any size. The following descriptions are given:—

"New Laid," First Quality.—Yolk translucent or faintly visible; white translucent and firm; shell clear or faintly mottled; depth of air space rarely exceeding ⅛ inch.

"Fresh Eggs," Second Quality.—Yolk more visible, yet keeping near the centre; white translucent and firm, but weaker than first quality; shell usually clear or faintly mottled, but may be distinctly mottled; air space usually ⅛ to 3-16 inch in depth.

Third Quality.—Yolk clearly visible, swinging freely, but not anywhere in contact with the shell; white translucent, but weaker and more watery than second quality eggs; shell mottled, spots spreading and merging into one another; air space 3-16 to ⅜ inch in depth. Eggs of this quality are suitable for cooking.

The highest price is obtained for brown-shelled eggs on the British market.

Egg Export of Denmark.

Fr. Möller detailed the Danish export of eggs, carried out by the Danish Farmers Co-operative Egg Export Association, which was founded in 1895, and now embraces about 540 affiliated local societies or circles, with a total membership of more than 50,000. Every egg is stamped with a rubber stamp which indicates the local society, and in addition the individual member, so that any egg can be traced from the breakfast table in England to the actual Danish poultry farm upon which it was laid.

Eggs are not sold by the score or the dozen, but by weight. The committee of the Central Society fixes the price every week, according to market quotations.

At the central packing stations the eggs are graded into the following sizes:—13, 14, 15, 16, 17, 18, and sometimes to 20 lbs. for 120 eggs (great hundred). The 15-lb. "pack" is the 2-oz. egg, so that the 20-lb. pack actually represents 32 ozs. to the dozen!

The eggs are sorted first on to wooden frames for size, and then tested, so that dirty, stale, or otherwise inferior eggs may be rejected. Clean rye straw is used at the top and bottom of each crate, with wood wool between each layer, the crates commonly containing twelve great hundreds. Any member who has delivered defective eggs is warned for the first offence, and then fined for subsequent offences.

Cellars are also used for pickling eggs, and these eggs are subsequently marketed, after being carefully tested as pickled eggs.

At the end of the year the net profit is distributed amongst the members in proportion to the value of eggs which each member has supplied. This system of co-operation assures that the maximum price will be received by the producer, as there are no middlemen's profits to be paid out of the money received from the English merchant who purchases the eggs.

Ordinance Relative to Sale of Eggs in Paris and the Seine District.

The sale of eggs is controlled by the Prefect of the Police, and all bad eggs have to be destroyed under the supervision of the sanitary veterinary inspector. Egg merchants who "candle" their eggs without the assistance of a testing inspector must advise the sanitary service of all eggs found spoilt. Where eggs can still be used, if there is no delay in immediate use, they may be utilized by dry biscuit makers. These eggs are sold as "waste" eggs. Biscuit manufacturers using these eggs must notify the Prefecture of Police, and their factories are under control of the sanitary veterinary inspector.

Preserved eggs must be sold as such, and dairy produce shops, groceries, biscuit manufactories, &c., where eggs are either sold or utilized for alimentary purposes, are subject to inspection. A special service is made available by the sanitary inspection branch, whose work consists of verifying the contents of parcels.

In limiting, if necessary, the waste, *i.e.*, the number of broken, spoilt, frozen, and small eggs.

In calculating the number of eggs that must be repaid to the buyer.

Where this service is made use of, the number of eggs missing or in excess is counted, and waste will give right to the following conditions:—

(*a*) Two-thirds of the number of broken eggs, except that any number over 3 per cent. of broken eggs shall be repaid in full.

(*b*) The total number of spoilt eggs.

(*c*) Two-thirds of the number of eggs called "small stains."

(*d*) Half the number of frozen eggs, or eggs kept in lime.

(*e*) One-third of the number of small eggs. Those are considered small which will pass through a ring of 35 millimetres diameter.

(To be continued.)

OUR BACKWARD COW.

By R. T. McKenzie, Senior Dairy Supervisor.

Lord Northcliffe, in a series of articles in *The Times* entitled "The Empty Continent," comments on the backwardness of the Australian cow compared with the Danish, which produces nearly twice as much under harsher natural conditions. Our average yield per cow is about 150 lbs. of butter fat, whilst in Denmark it is in normal years about 240 lbs.

In this country, with such congenial soil and climate, it is a great reproach to the enterprise and progress of the dairy industry that the productiveness of our average cow should be so low.

Recently several conferences of those engaged in the industry have been held to consider the economic situation caused by the rapidly falling price of butter fat.

One speaker declared that it cost 2s. per lb. to produce. Various suggestions were made to control prices by arbitrary methods, to turn milk into other goods such as dried milk, condensed milk, casein, and so on, where the fall in price was negligible compared with butter. No one suggested that by an intelligent campaign the capacity of the dairy herds could in a brief space of time be doubled, and thus lower by half the cost of producing a pound of butter fat. That this could be accomplished is beyond doubt, but there is no royal road. Before it can be attained the scrub bull has to disappear from the majority of dairy herds, and a great extension of herd testing must be made.

With the great fall in the price of butter the mongrel bull becomes a national calamity, and because only a few register records of individual cows the average dairy farmer keeps nearly twice as many cows as his output warrants. The old phrase, that the bull is half the herd, is true; in fact, this is an under-estimation of his value. The bull is the pivot upon which the future efficiency of the whole herd rests. Thus the first stage in the improvement of the dairy cow must begin with the bull. He may sire all the calves in the herd, if it is not a large one, exercising a potent influence on every calf for good or evil.

In America there is a nation-wide movement to wipe out the scrub bull by legislation on somewhat similar lines to our own stallion legislation. West Virginia has taken the lead with such success that the epitaph of the scrub bull has been written.

Nearer home, in South Australia, the authorities are considering proposals on the same lines. A proposal has been made in New Zealand that all dairy bulls be registered, and a tax put on the mongrel sire.

A dairyman cannot make his industry more interesting and profitable than by the grading up of his herd, and it can be done in a very short time by the use of a pure-bred sire whose ancestors have genuine pedigrees of performance, on selected cows. The Government standard-herd test shows that we have a great number of high-class dairy cattle amongst the pure breeds, and by the use of a sire from these proved yielders, the dairy capacity of the average cow could be doubled in a

few years. It is much easier to improve the milking qualities of a herd of cross-breds than of a pure-bred herd. The scrub bull does not possess the prepotency of the pure-bred. Briefly, he is deficient in that prepotency of blood that enables the pure-bred to impress upon his progeny the characteristic features of his breed to a greater or less extent, no matter what class of cow he may be mated with.

The present juncture would be an opportune time to start herd-testing societies. It is only by systematically weighing and testing the milk of each cow that the "robber" can be detected. There is no other way. It has been found by the experience of herd-testing societies in every country in which they have been established that about 30 per cent. of the cows tested are unprofitable. In other words, they do not pay for the time, care, and feed bestowed on them. No doubt when butter fat was worth 2s. 8d. per lb., almost any cow showed a profit above her keep, but with the decline of the price of butter fat to less than 1s. per lb. only the best will show a profit.

Milking qualities, as with other characteristics, are hereditary. Therefore, for breeding purposes, it is very necessary that the farmer should know the best milkers. It seems a great reflection on the intelligence of dairymen that not 1 per cent. of the cows in Victoria are tested. It is no wonder then, that, while other great dairying countries are yearly increasing their output per cow, through the agency of the cow-testing societies, we in Victoria are standing still, if we are not actually going backwards. If the present slump impresses on the dairy farmer the necessity of improving the quality of his herd by the use of a pure-bred sire and systematic culling of his cows, it may be a blessing in disguise.

PLANTING AND RECONSTITUTION OF VINEYARDS.

Conditions Governing the Distribution of Phylloxera-Resistant Vine Rootlings and Cuttings.

The conditions subject to which Victorian vine-growers may purchase phylloxera-resistant vine cuttings and rootlings (grafted and ungrafted) from the State Vine Nursery, at Wahgunyah, have been drawn up for the current year, and copies of same are available on application.

Beyond the necessary alterations of dates (substitution of 1922 for 1921, &c.) the conditions are practically the same as for last season. There is no alteration in price.

The time within which applications will be received remains as it was last year, as will be seen below. Applicants are required to finally decide, when filling in their application forms, as to their stock and scion requirements; no amendment can be permitted later.

It will suffice here to explain that resistant vines are supplied to intending planters in any of the following forms, and at the prices stated; packing extra in the case of consignments forwarded by rail:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £12 (Deposit, 30s. per 1,000).
Resistant rootlings, ungrafted, at per 1,000, £3 (Deposit, 15s. per 1,000).
Resistant cuttings, at per 1,000, £1 10s.

APPLICATION FORMS.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Manager, Viticultural Station, Rutherglen.

Separate forms are provided for (*a*) Grafted Rootlings (green form); (*b*) Ungrafted Rootlings and Cuttings (yellow form). Applications must be filled in on the proper forms, and accompanied by a deposit as specified above.

Each applicant for forms will be supplied with a copy of the detailed conditions governing the distribution of phylloxera-resistant vine rootlings (grafted and ungrafted) and cuttings.

Applicants are earnestly requested to thoroughly familiarize themselves with these. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed therein, nor can any request for special consideration be entertained.*

DATES BEFORE WHICH APPLICATIONS MUST BE MADE.

For Grafted Rootlings (1923 distribution, June to August inclusive), applications will be received until 30th June next. (For the 1922 distribution the time for receiving applications closed on 30th June, 1921, and present applicants cannot be supplied until 1923.)

For Ungrafted Rootlings, to be distributed from July to August, 1922, inclusive, applications will be received until 31st July, 1922.

For Cuttings (see conditions), applications will be received until 30th June, 1922.

SUPPLYING CLEAN DISTRICTS.

The nurseries in which grafted rootlings are raised being situated in phylloxerated districts, *these cannot be supplied to growers in clean districts*. To do so would be manifestly unfair to owners of existing vineyards in such districts.

PIG-FEEDING EXPERIMENTS IN ENGLAND.

Experiments have been carried out recently at Reading University College Farm to determine the value of whey in feeding pigs, and it has been demonstrated that pigs fed on whey and whey constituents, and having access to grass, will thrive to a much greater degree than those kept under the usual sty conditions and fed on swill, &c., both

in regard to appearance and quality of their flesh. These experiments suggest that whey contains an insufficiency of fat-soluble vitamine A. to allow excess for storage in the fat, and that grass or green food makes up for the deficiency.

Results show that young pigs fed on grass and toppings for a period of 84 days increased on the average of 49 lbs. in live weight, whereas similar pigs fed with whey, grass and toppings for the same period made an average live weight increase of 72 lbs.

These experiments tend generally to substantiate what has for a long time past been the opinion of cheesemakers throughout the country—namely, that very considerable advantage can be gained by the feeding of whey to pigs.

Pigs and the Fat-Soluble Factor.—Another experiment at Reading University College Farm has recently been carried out with the object of ascertaining the influence of the fat-soluble factor on the growth of pigs. Four animals were employed, divided into two groups. Group 1 was placed on a diet containing the fat-soluble factor, and Group 2 was kept on a diet rigorously restricted in that factor. The test was carried out over a period of five months, and further experiments are in progress.

The results so far obtained are as follows:—

(1) No definite rickets were induced in sucking pigs fed from birth on a diet rigorously restricted in the fat-soluble factor.

(2) The addition of the fat-soluble factor in the form of cream, cod-liver oil and lucerne, to a deficient diet stimulated growth in pigs declining in weight.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

CULTIVATION.

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. Autumn ploughing may be rough, but care should be taken to plough to the trees, so that a drainage furrow is left between the rows.

MANURING.

It is just possible, where heavy crops have been carried, that a top dressing of stable manure will be required to add humus to the soil. The fertility of the soil must be maintained; and, although stable and

chemical manures as a general rule are of undoubted value as tree stimulants, well-cultivated and thoroughly tilled land will always carry fair crops with far less manure. Further, if the orchard land is well drained, cultivated, and sub-soiled, any manures that are used will be far more beneficial to the trees. The more suitable the conditions that are given to the trees, the better they can appreciate and assimilate their food.

Perhaps the most useful and valuable of manures is stable manure. It is of great use, not only as a manure and as an introducer of necessary bacteria into the soil, but its value in adding humus to the soil is incalculable. Organic matter, such as stable manure, introduced into the soil quickly becomes humus; this greatly ameliorates and improves soil conditions. It is impossible to say what quantity of stable manure is necessary per acre; that can be determined only by circumstances. Orchards in different climates and varying soils will require differing quantities. A too liberal use of stable manure will be over-stimulating in most cases, and at all times an excess beyond what is necessary for present use will only be waste, as humus is readily lost from the soil, once it is in an available food form.

It has been pointed out in these notes previously that an improved physical condition is far more profitable to the fruit-grower than the continued use of manures. A tree will be far more productive if it is happy in its soil conditions; uncomfortable conditions will always result in unprosperous trees.

A dressing of lime, using about 4 or 5 cwt. per acre, is of great value in stiff or heavy orchard lands; and it may be given at this season. The lime, which must be fresh, should be distributed in small heaps between the trees, covered with a layer of soil, and allowed to remain for a few days before ploughing or harrowing in.

PESTS.

The advice given last month for spraying should be followed, particularly where any oil emulsions or washes are to be used.

Orchards will benefit if an attack is now made upon the Codlin moth. All hiding places, nooks, and crannies, where the larvæ have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work than he will have in the spring time.

GENERAL WORK.

Drainage systems should now be extended with as little loss of time as possible.

New planting areas should be prepared, and subsoiled or trenched wherever possible.

The Vegetable Garden.

Weeds must be kept down in the vegetable garden. Weeds are generally free growing at this season; their growth is very insidious, and they will crowd out the young seedlings or plants in a very quick time.

Hoeing and hand weeding must be resorted to, preferably hoeing. The frequent use of the hoe in winter time is of much benefit in the vegetable garden. A varied assortment of crops is now being produced; and if these can be kept growing much better crops will result. The soil quickly stagnates in the winter, and the only way to prevent this is to keep the surface stirred. Thus, a double service is performed with the aid of the hoe.

The application of lime is of great necessity at this season. In addition to amending unhealthy and unsuitable soil conditions, lime is particularly useful as an insecticide. It assists in destroying in immense numbers both eggs and insects that would breed and live in the ground ready to do damage to all classes of vegetable crops. Therefore, wherever possible, the soil should receive an application of lime. The garden should, as well, be manured with stable manure, but not for some weeks after the lime application.

Cabbage and cauliflower plants may be planted out; and seeds of parsnips, carrots, onions, peas, and broad beans may be sown.

The Flower Garden.

The whole flower section should now be thoroughly dug over. All beds should be cleaned up, top dressed with manure, and well dug. The light rubbish, such as foliage, twiggy growths, weeds, &c., may all be dug in, and they will thus form a useful addition to the soil. These should never be wasted. Only the coarser and stouter growths should be carted away for burning, and then the ashes may be used as manure. No part, whatever, of garden rubbish or litter need be wasted. In one form or another it should be replaced in the soil.

May is a good month for establishing new gardens, and for planting out. All deciduous plants and shrubs may now be planted. It is not necessary to dig a deep hole for planting. A hole in which the roots of the plant can be comfortably arranged, without crowding or cramping, will be quite sufficient for the purpose.

Continue to sow seeds of hardy annuals, including sweet peas, although the main crop of sweet peas should by this time be well above ground. Where there has been any overplanting, the young plants will readily stand transplanting, and this will greatly assist those that are to remain. Annuals should not be crowded in the beds. They require ample room for suitable development, and thus the seeds should be sown thinly or the plants set out a good distance from each other.

All herbaceous perennials that have finished blooming may now be cut down. Included amongst these are phlox, delphiniums, &c. If these are to remain in their present situation for another season it is always an advantage to raise them somewhat, by slightly lifting them with a fork, so that too much water will not settle around the crowns; they may also be mulched with stable manure, or the manure may be forked into the soil around the crowns.

REMINDERS FOR JUNE.

LIVE STOCK.

HORSES.—Those stabled and in regular work should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley. Paddocked horses should be looked at from time to time to ascertain if they are doing satisfactorily.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed. and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. If in low condition feed well to tide them over the period and stimulate milk flow. It should be borne in mind that the cows most liable to milk fever are those that have been low in condition and are rapidly thriving. The treatment described in the *Year-Book of Agriculture*, 1905, should be almost invariably successful. It will generally be found most profitable to have cows calve in autumn. They will then pay well for feeding through th winter, and will flush again with the spring grass. Calves should be provided with warm dry shed. Cows and heifers for early autumn calving may be put to the bull. Observe strict cleanliness and regularity with regard to temperature and quantity of feed to avoid losses and sickness incidental to calf rearing.

PIGS.—Supply plenty of bedding in well ventilated sties. Sows in fine weather should be given grass or lucerne run. Bulletin on the Pig Industry is now available.

SHEEP.—Clear muck-balls from tails and legs of all sheep. Have the wool cleared from round udders and eyes of all young lambing ewes, and see them first thing every morning. Mark the ram lambs at earliest chance, providing they are strong and the season assured. Cut off ewes with oldest wether lambs to best pasture available.

Sheep with overgrown hoofs are unthrifty. Whenever noticed trim back into shape; they cut easily during winter. If left, are conducive to lameness, and even foot rot. In the case of common foot rot, or scald, the feet can be placed in a thick paste made of lime and hot water. Obstinate cases of long standing may need more drastic remedies, and persistent attention. In all cases pare away all loose portions, and leave the diseased parts clearly exposed.

Foxes are more ravenous during winter months. Sparrows, starlings, and parrots are good bait. Poisoning lambs already killed usually accounts for scavenger foxes only.

Every fox is not a lamb killer. Remove all lambs for two or three nights if at all possible, and birds then will rarely fail to entice Reynard the second or third night.

Powdered strychnine, just sufficient to cover nicely a threepenny-piece, is the usual dose. On the more valuable lambs fix a light tin collar, cut from 2 inches wide at the top of the neck to 3 inches wide below, fastened underneath in one place only, near the breast, with fine wire, and lying open towards the throat, allowing the lamb to both suck and feed. It should be cut as large as possible, yet not large enough to permit of its falling off over the lamb's head. This makes a guard that rarely fails to prevent a fox getting to the main blood vein. Remove the guards when the lambs are about eight weeks old.

POULTRY.—Supplies of shell grit and charcoal should always be available. Sow a mixture of English grass and clover; this not only removes taint in soil but provides excellent green fodder for stock. Where possible, lucerne and silver beet should now be sown for summer feed; liver (cooked) and maize aids to egg production during cold weather. Morning mash should be mixed with liver soup given to the birds warm in a crumbly condition. All yards should be drained to ensure comfort for the birds.

CULTIVATION.

FARM.—Plough potato land. Land to be sown later on with potatoes, mangolds, maize, and millet should be manured and well worked. Sow malting barley and sow cereals. Lift and store mangolds, turnips, &c. Clean out drains and water furrows. Clean up and stack manure in heaps protected from the weather.

ORCHARD.—Finish ploughing; plant young trees; spray with red oil or petroleum for scales, mites, aphis, &c.; carry out drainage system; clean out drains; commence pruning.

VEGETABLE GARDEN.—Prepare beds for crops; cultivate deeply; practise rotation in planting out; renovate asparagus beds; plant out all seedlings; sow radish, peas, broad beans, leeks, spinach, lettuce, carrot, &c.; plant rhubarb.

FLOWER GARDEN.—Continue digging and manuring; dig all weeds and leafy growths; plant out shrubs, roses, &c.; plant rose cuttings; prune deciduous trees and shrubs; sow sweet peas and plant out seedlings.

VINEYARD.—Thoroughly prepare for plantation, land already subsoiled for the purpose. Remember that the freer it is kept from weeds from this forward, the less trouble will there be from cut-worms next spring. Applications for grafted resistant rootlings and cuttings must be made before the end of the month—see current issue. Pruning and ploughing should be actively proceeded with. In northern districts plough to a depth of seven or eight inches. Manures should be applied as early as possible.

Cellar.—Rack all wines which have not been previously dealt with. Fortify sweet wines to full strength.

THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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A STUDY OF THE WHEAT YIELDS IN THE WIMMERA AND NORTHERN DISTRICTS,

Illustrating Some Factors Controlling the Progressive Improvement in the Efficiency of a Country's Agriculture.*

In the Wimmera, 16-17-in. rainfall, where 600,000 acres are sown annually to wheat, the average yield per acre for the whole area has been lifted inside 25 years from 7.6 bushels to 19.1 bushels—an increase equal to 151 per cent. In the Northern District, where an equal area is sown, the corresponding increase is 3.4 bushels per acre, or 32 per cent. The rainfall in both districts is similar.

During the past 50 or 60 years the bulk of Australian farmers have given much more attention to the pioneering problems incidental to the development of their virgin lands than they have to raising the standard of their farming methods. And the general success achieved under these conditions has gradually moulded a popular conception of a progressive agricultural policy as a matter of so many acres of Crown lands thrown open and settled. But here and there are instances where, replacing the rough-and-ready pioneering methods, is found a highly developed system of agriculture specially suited to local conditions. The effect of this is always reflected to an amazing degree in the prosperity of the district.

Comparisons of this sort lead one to believe that what to-day is commonly termed successful land settlement in most districts is really a poor thing beside what may be yet achieved. But little progress will be made while present practices are thought satisfactory, and one fundamental problem which those responsible for the propagation of better agricultural methods must face, is that of securing the general recognition of the present methods in most districts as imperfect. That is the first stage on the road to the discovery of superior practices and their general adoption by members of rural communities.

* Address delivered by H. A. Mullett, B. Ag. Sc., Chief Field Officer, at the Annual Convention of the Chamber of Agriculture, held at Horsham, April, 1922.

The Limiting Factor to Progress.

There is room for considerable clarification in the general conception of the manner in which the progressive improvement of the efficiency of local agricultural methods may be brought about. Commonly it is believed that Governments, through their Agricultural Departments, are almost solely responsible for any slackness in the rate of improvement, but it can be shown that as a rule the limiting factor is local opinion.

In practice the rate of progress is determined by the interplay of several factors. There are those that lead and there are those that resist progress. On the one hand, we have what I may term the "scientific lead," comprising those institutions and individuals whose special business it is to pursue the organized discovery of new scientific facts about agriculture and to secure their propagation broadcast throughout the rural community. Agricultural Departments, University Colleges of Agriculture, special research workers, and scientific agricultural publications are illustrations of the "scientific lead." Then that is supplemented by what I shall term the "local rural lead." By that is meant that body of advanced thought that exists in each local district. It is well known that in every district there are to be found men who farm better than the rest. Others again show special aptitude in devising means of putting into practice ideas which may be supplied to them and which are an advance on previous methods. All these individuals are usually specially receptive of progressive thought, and, in effect, they act as local investigators, demonstrators, and propagandists. Included in the "rural lead," of course, are such organizations as agricultural societies, farmers' bureaux, and the local rural press. On the other hand, there is what may be called the "local inertia"—that is, natural resistance to change on the part of the conservative body of the people.

From these considerations it is fairly obvious that progress will depend on the speed with which new facts can be discovered by scientists and by the best farmers, as well as on the rate at which these facts can be spread against the dead weight of local adverse opinion.

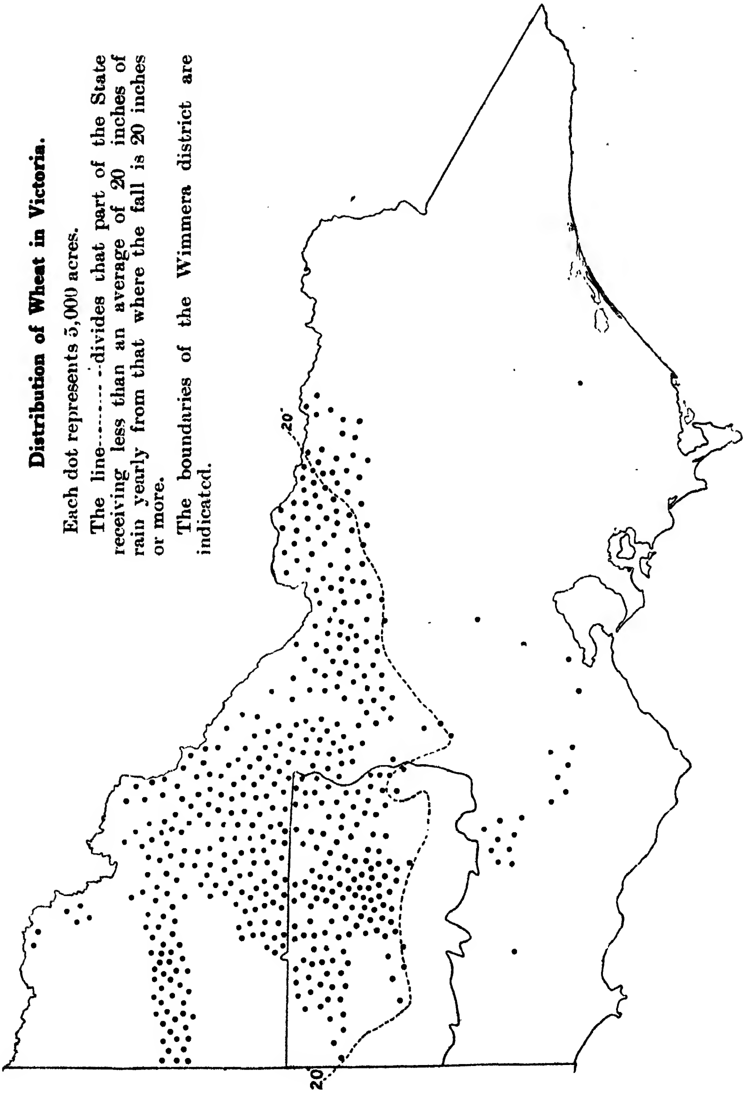
It can readily be demonstrated that new facts in agriculture can be discovered far quicker than they can be spread. And if that is so, it means that the limiting factor in the situation is largely local opinion.

District organizations are in large measure the custodians of local thought on agricultural matters. They are the leaven which quickens the whole. Upon them, therefore, devolves a heavy responsibility. But how inadequately organized is the "rural lead" in most districts! Yet it can be shown that where it is most active there most progress is found.

Twenty-five Years' Progress in the Wimmera.

With the object of illustrating these points, I have made some statistical studies of production in the Wheat Belt. Naturally the Wimmera has been chosen for extended reference, because it is a district which many members of the Convention are visiting for the first time, while its reputation for producing 40-bushel wheat crops over large areas must have excited general interest. Figures will be submitted showing the rate of progress during the past 25 years here, and comparisons will be made with that in other districts.

In the first place, it should at once be made clear that the 40-bushel averages are not secured for the whole area; but, nevertheless, the



Distribution of Wheat in Victoria.

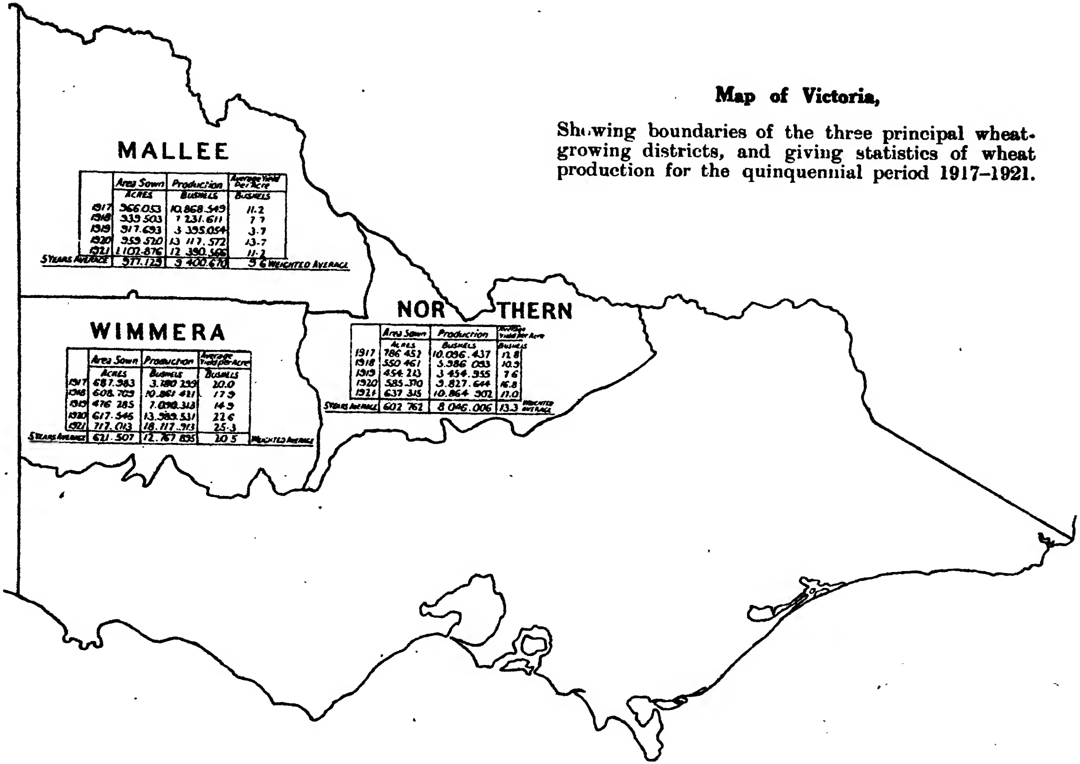
Each dot represents 5,000 acres.

The line-----------divides that part of the State receiving less than an average of 20 inches of rain yearly from that where the fall is 20 inches or more.

The boundaries of the Wimmera district are indicated.

Map of Victoria,

Showing boundaries of the three principal wheat-growing districts, and giving statistics of wheat production for the quinquennial period 1917–1921.



MALLEE

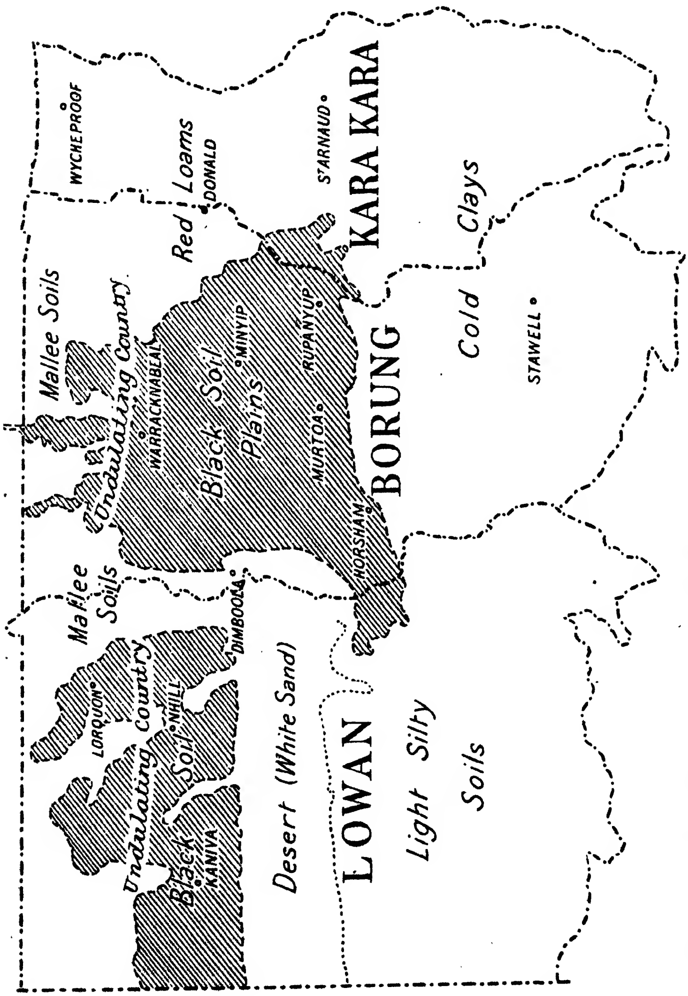
	Area Sown	Production	Average Yield per Acre
	Acres	Bushels	Bushels
1917	966.053	10.868.549	11.2
1918	939.503	7.231.611	7.7
1919	917.693	3.395.054	3.7
1920	959.520	13.117.572	13.7
1921	1.102.876	12.390.566	11.2
5 Years Average	977.125	9.400.670	9.6 Weighted Average

WIMMERA

	Area Sown	Production	Average Yield per Acre
	Acres	Bushels	Bushels
1917	687.383	13.780.239	20.0
1918	608.709	10.861.411	17.9
1919	476.285	7.090.313	14.9
1920	617.545	13.989.531	22.6
1921	717.013	18.117.913	25.3
5 Years Average	621.507	12.767.895	20.5 Weighted Average

NORTHERN

	Area Sown	Production	Average Yield per Acre
	Acres	Bushels	Bushels
1917	786.451	10.086.437	12.8
1918	550.461	5.386.093	10.9
1919	454.213	3.454.955	7.6
1920	585.370	9.827.644	16.8
1921	637.315	10.864.302	17.0
5 Years Average	602.762	8.046.006	13.3 Weighted Average



Detailed Plan of the Wimmera District, showing the counties and the approximate boundaries of soil types.

NOTE.—The area indicated as black soil is interspersed with red patches. The northern portions of both areas are more or less undulating, the rising ground being as a rule red loam.

average yields for counties in Wimmera are phenomenally high compared with other parts of the State. For instance, at last harvest the Wimmera county of Borung, where 359,000 acres were sown to wheat, the average yield per acre was 28.05 bushels. Other counties in the Northern District, with a corresponding rainfall, and rather less area sown, did not average more than 17 bushels per acre. The State average last year was 16.8 bushels.

Many individual farmers in the Wimmera, however, have frequently obtained yields of 40 bushels and more in recent years. The following concrete instances may be selected at random to illustrate this:—

Table Showing Some Recent Wimmera Yields.

	Acres.	Bushels.
Longerenong Agricultural College, Dooen, 7-year average	300	35
Longerenong Agricultural College, Dooen, average 1921	..	42
Hobbs & Knuckey, Dooen, average 1921	160	50
A. Dunlop, Rupanyup, average 1921	160	49
R. J. Jackson, Rupanyup, average 1920	265	43
R. J. Jackson, Rupanyup, average 1921	265	43
A. H. Krelle, Minyip, average 1921	300	40
R. Blackwood, Nhill, average 1921	250	43¾
R. Blackwood, Nhill, average 1921, best 100 acres	100	48

These are yields which must excite the admiration of practical men. They are typical of many others, and are not at all accidental. The men named regularly secure much higher average yields than their fellows, and they do it because their methods are superior. They represent part of the "local rural lead" which has been referred to. Wimmera agricultural societies have gone much further than any others in the Wheat Belt in bringing to light the best crops each year in the districts and in giving publicity to the methods by which these crops have been raised. The result has been that there are a greater proportion of men farming according to the best-known practice than in any other wheat area. Agricultural societies in other districts are neglecting a most powerful aid to progress in not taking advantage of the valuable experience there is locked up in their own districts. In this connexion a properly-conducted crop and fallow competition is an efficient aid.

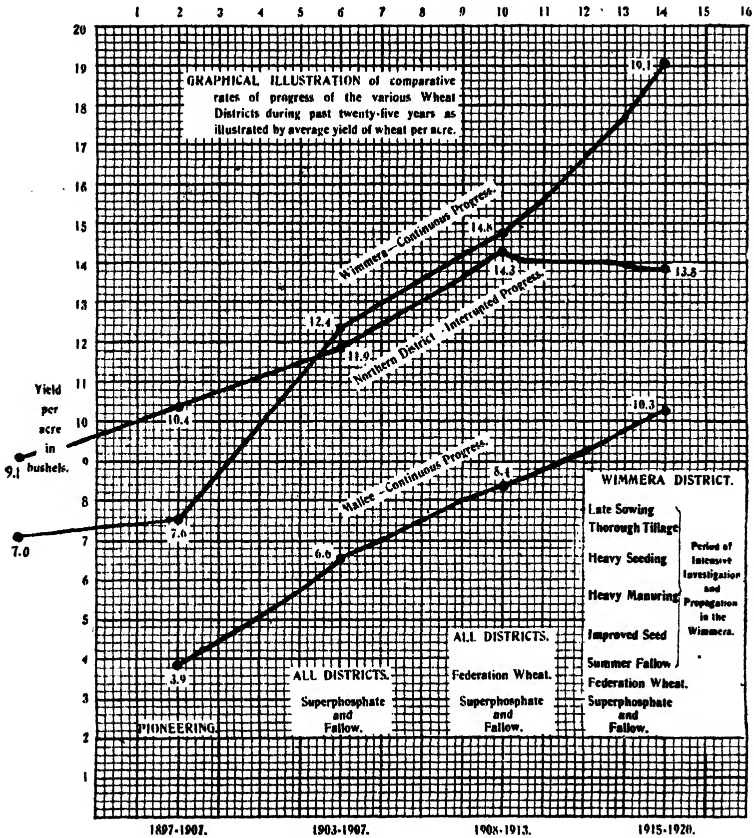
Even in the Wimmera the process of levelling the 20-bushel men up to those who can raise 40 bushels is by no means complete, but it is proceeding at such a pace that it would not be at all surprising to see the average yield of Wimmera permanently raised to 25 bushels per acre during the next ten years.

The instances just quoted will serve for the time being to illustrate the part that can be played by the "rural lead." It will now be necessary to demonstate the *rôle* of the "scientific lead," and to show the reaction to it in the Wimmera and elsewhere.

To fully comprehend this aspect of Wimmera development the clock should be put back 40 odd years. The area should be pictured as it was at that time—an arid sheep-walk. The mind's eye will readily conjure up the struggling pioneers who tilled the soil and grew their five-bag crops and thought them good. The men who came originally to the Wimmera were faced with new conditions. At first they used methods which have since been proved to be totally unsuited to local conditions. They practised deep ploughing, stubble sowing, and early seeding. They were heavily handicapped, and so it was until 20 or 25 years ago; then yields rapidly began to increase, because epoch-making discoveries were made and adopted.

Increased Yields due to Improved Practices.

It is possible to co-relate the increases obtained with the introduction of the discoveries referred to. This may be done by comparing the average yield per acre before and after the discoveries. If sufficiently long periods are taken, say at least five or six years, and big drought



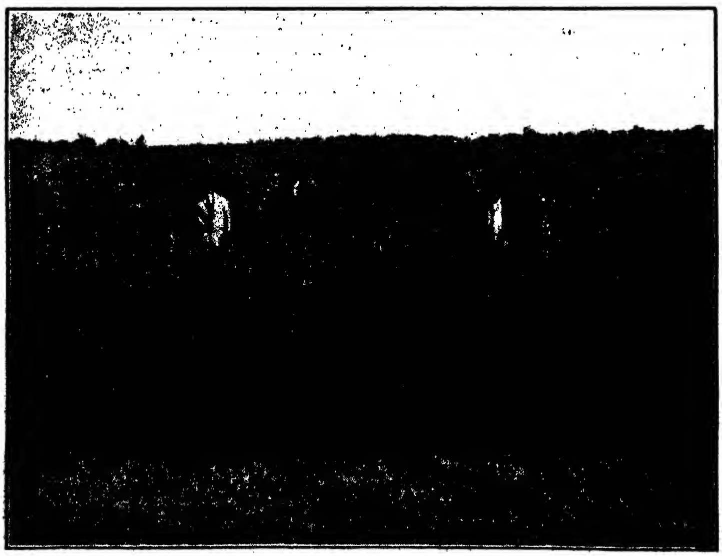
years omitted, the effect of seasonal fluctuations is avoided. The graphical illustration above will give at a glance the history of the upward trend of the yields.

For the period 1892-1896, the average yield per acre of wheat in the three Wimmera counties was 7.0 bushels per acre. For the period 1897-1901 it was only 7.6 bushels per acre. Then superphosphate and seed drills were introduced. The idea of manufacturing superphosphate had originated in the brain of the German scientist, Liebig, many years before, and it was Sir John Lawes who successfully reduced the idea to a commercial process. But it remained for Mr. A. N. Pearson and Dr.

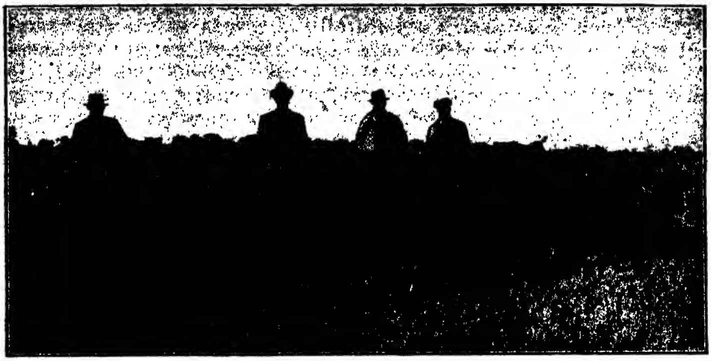
Consistent Wheat Growing in the Wimmera.

Five Prolific Crops Grown by Mr. Robert Blackwood, Nhill, in successive years.

I.—Portion of 160 acres, 1917. Awarded first prize, Nhill Farm Competitions. Average yield, 45 bushels per acre.

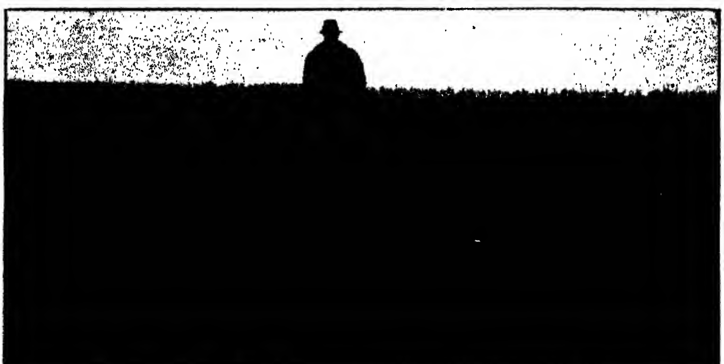


II.—This crop was awarded second prize in the Nhill Farm Competitions, 1918. The yield was not less than 36 bushels per acre.



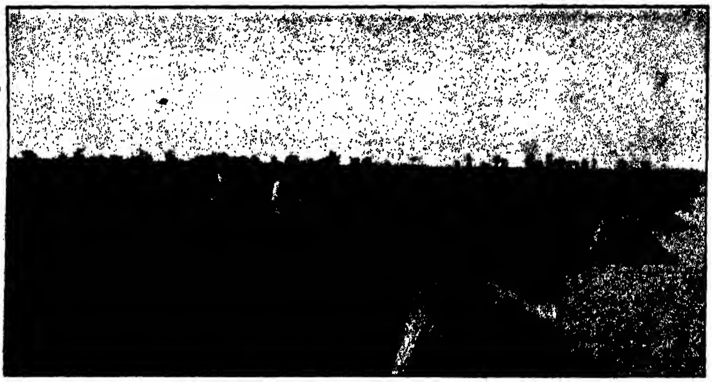
III.—Awarded Second Prize, Nhill Farm Competitions, 1919. 100 acres. Average yield, 30 bushels per acre. (Rainfall during growing period, 7 inches only.)

IV.—Crop of Federation, 1920. Average yield not less than 33 bushels.



V.—250 acres, 43½ bushels per acre. Best 100 acres, 48 bushels per acre. Awarded First Prize, Nhill Farm Competitions, 1921.

Howell to demonstrate to Victorian wheat farmers the value of the manure. Much scepticism was naturally met with at the start; but so potent was the influence of the small sprinkling of manure advocated—about 56 lbs.—that yields rapidly mounted. About this time it was becoming clear to advanced farmers that systematic bare fallowing—a practice long known—was essential for maximum crops on the rainfall of the Victorian Wheat Belt. The 1902 drought brought it home to many in a decisive fashion that stubble crops were a failure. Science supplied



I.—Crop of Federation, 265 acres, averaging 43 bushels per acre, 1920. Mr. R. J. Jackson, Rupanyup.

II.—Portion of 270 acres, Federation, averaging 43 bushels per acre, 1921. Mr. R. J. Jackson, Rupanyup.

the explanation of the success of bare fallowing that moisture was saved for the growing crop from the year before, and suggested better methods of conserving the maximum of moisture by more efficient mulching.

The net result of these momentous advances was that in a decade the average yield per acre of the three Wimmera counties was lifted by 4.8 bushels per acre, comparing the two five-year periods.

Then what might be termed the Federation era was entered upon. This wheat was first introduced in 1904. It was the definite creation of

the scientist Farrer for Australian conditions. By the end of the next five years it had completely ousted the old types, and added at least a couple of bushels to the average yield per acre.

These discoveries were shared by farmers in the other wheat districts, though the recognition of the value of fallowing there has never been quite so keenly realized.

By the 1908-1913 period the average yield per acre in the Wimmera had thus reached 14.8 bushels per acre. Then the *post* 1914 period follows.

Despite the fact that no epoch-making discoveries were made comparable with superphosphate, Federation wheat, or the value of fallowing, advances were witnessed as great as any before. It was a period of careful exploration of most of the factors involved in local wheat cultivation, and of the propagation of the discovered facts from experimental field and advanced farm to farmers at large. The result was that the average yield for the six years ending 1920 was 19.1 bushels per acre—an increase on the previous six-year period of 4.3 bushels per acre, and 11.5 bushels, or 151 per cent. better than the five years 1897-1901. Than this, I believe, nothing could more clearly indicate the part played by the "scientific lead," and a comparison of the average Wimmera yields with those of some of the best men indicates that even greater advances could be shown by a study of the yields of the best farmers. The difference between these yields and the Wimmera average, too, is to some extent a measure of the local resistance to the scrapping of obsolete practices.

But if these are the changes which have been wrought in the Wimmera, what has been the reaction in other districts? The Northern District, comprising the counties of Moira, Gladstone, Gunbower, Rodney, and Bendigo, is the only other statistical district with an equal area sown to wheat and enjoying a similar rainfall. The soils are somewhat different, but it cannot be argued that there is more good land under cultivation in the Wimmera than in the Northern District. Ten years ago the black Wimmera soil was not regarded as so productive as it is to-day. One's idea of the value of a soil grows as the methods of cultivating it are perfected.

TABLE SHOWING AVERAGE WHEAT YIELDS FOR THE PERIOD 1897-1920, IN QUINQUENNIAL OR SEXTENNIAL PERIODS, FOR WIMMERA, MALLEE, AND NORTHERN DISTRICTS

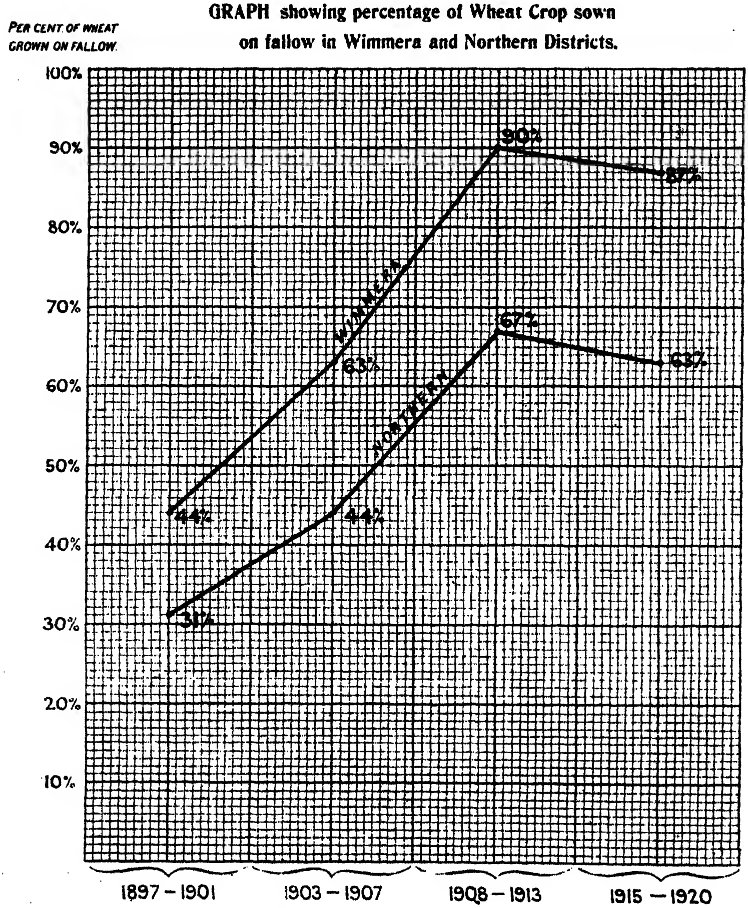
Period.	Wimmera.		Mallee.		Northern.	
	Area Sown.	Yield.	Area Sown.	Yield.	Area Sown.	Yield.
	acres.	bush. p.a.	acres.	bush. p.a.	acres.	bush. p.a.
1897–1901 ..	640,320	7·6	622,314	3·9	590,313	10·4
1903–1907 ..	624,617	12·4	631,982	6·6	638,996	11·9
1908–1913 ..	617,611	14·8	661,014	8·4	671,840	14·3
1915–1920 ..	681,342	19·1	1,049,803	10·3	714,880	13·8
Net increase	..	11·5	..	6·4	..	3·4

NOTE.—(1) The figures given for average yield per acre are the true "weighted" averages. (2) The years 1902 and 1914 were drought years of such severity that little or no wheat was harvested. They have been omitted.

A glance at the table shows that while the Wimmera advanced 11.5 bushels per acre, the Northern District moved from 10.4 to 13.8, an increase of only 3.4 bushels in twenty odd years.

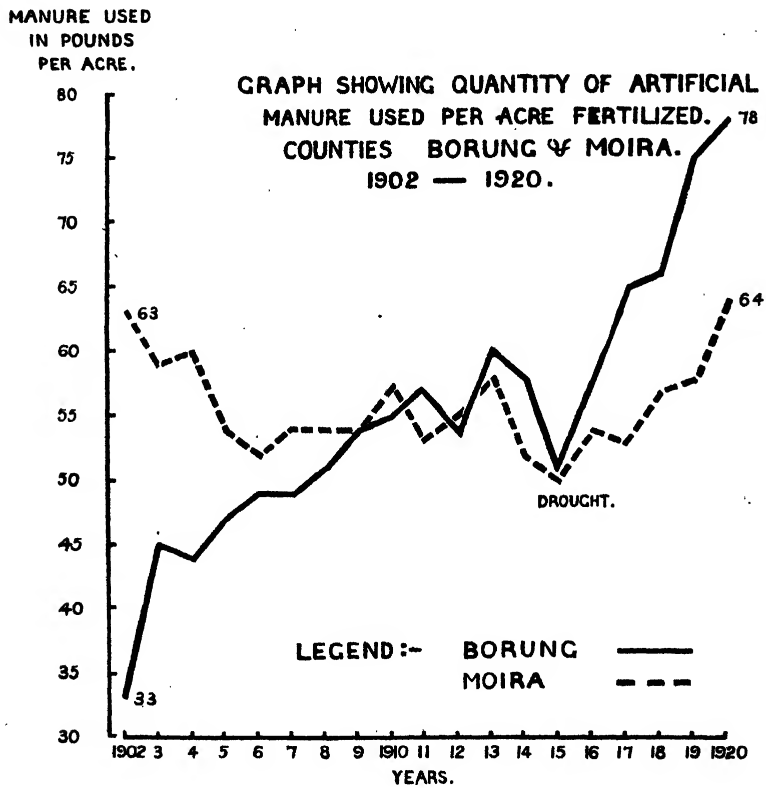
During the *post* 1914 era, a period of great advancement for the Wimmera, the Northern District yields actually declined by .5 bushel per acre.

GRAPH showing percentage of Wheat Crop sown on fallow in Wimmera and Northern Districts.



It will be noticed that generally there is a poorer reaction in the Northern District following on the introduction of the improved practices. In other words, it means that there a smaller percentage of the farmers have adopted the improvements in full. This is well illustrated by a comparison of statistics in both areas for the percentage of the wheat crops grown in fallow each year and by the quantity of fertilizer used per acre in each district.

The careful fallowing of all wheat sown and the application of a liberal quantity of fertilizer, up to at least 1 cwt. per acre, have been strenuously advocated as fundamental for the success of the wheat crop in both districts. But it will be noted from the graph on page 332 that while there has been a steady increase in the percentage of wheat sown in fallow in both districts, the Northern District has always lagged behind to the extent of from 13 per cent. in the earlier years to 24 per cent. in recent years. For the period 1915-1920, 87 per cent. of Wimmera wheat was sown in fallow, while in the Northern District the percentage was only 68 per cent.



The slight falling off in the percentage of wheat sown in fallow in both districts during this particular period is due to the stubble sowing in 1915 following on the 1914 drought.

The graphical representation of the quantity of artificial fertilizer, comparing the Wimmera county of Borung with the northern county of Moira, presents an even more striking picture of the relatively slower rate at which improved practices are being adopted in the Northern District.

It shows the steady increase in the quantity of superphosphate used per acre in the Wimmera following the propaganda issued by the Agricultural Department. In the Wimmera county in 1902 only 33 lbs. were used per acre as an average, but by 1920 the amount used had been raised to 78 lbs. per acre, *i.e.*, an increase in the average dressing of 45 lbs. per acre over the whole area. In Moira there has been no corresponding increase; 64 lbs. were used per acre in 1902, and by 1920 it has been raised to only 66 lbs.

Of all the periods considered it will be noted that it is in the last one that the greatest difference between the comparative rate of progress in the two districts occurs. While the Wimmera has gone ahead 4.3 bushels for three counties, the Northern District has made no apparent advancement as indicated by the yield per acre. And in this connexion

A Fifty-bushel Crop grown by Messrs. Hobbs and Knuckey, Horsham, 1921.

it is worthy of note that during the past decade no less than seven distinct improvements in farming practice in the Wimmera have been recognised and largely adopted there. They are—

1. The discovery of the value and the adoption of June and July sowing, which confers a 4-bushel increase over May sowing in Wimmera.
2. The recognition of the value of thorough tillage of the fallow and the standardization of the methods of working the fallows. At least seven, and as many as fourteen, separate operations are now given by the most successful men, and the fallow is scientifically constructed.
3. The discovery of the value and the adoption of heavy seeding.
4. The discovery of the value and the adoption of heavy dressings of superphosphate.
5. The recognition of the value of selected seed.
6. The discovery and recognition of the value of the summer or fifteen months' fallow.

It does not follow, of course, that all of these practices are applicable elsewhere. Some of them certainly are not; but if not these, then other means of improvement are discoverable.

Some of the discoveries enumerated were made by a farmer and some by a scientist. But it is to the undoubted credit of the Wimmera Agricultural Societies that they had been made. In what they did they have been ably backed up by the agricultural press, a potent factor for

Open-air Lecture and Demonstration, Farmers' Field Day, organized by Nhill Agricultural and Pastoral Society.

Demonstrating the Good Points of the Winning Fallow at the Annual Crop and Fallow Competition organized by the Nhill Agricultural and Pastoral Society.

the dissemination of knowledge. These societies have sedulously fostered local experimental work. There are four separate experimental fields now in the district. The societies have been assiduous in promoting educational movements with the object of discovering improved practices

on individual farms and of passing them on. They have not regarded their activities as beginning and ending with the local show. For instance, for 21 years the Nhill Agricultural Society has held a crop and fallow competition, the objects of which are to discover the best crops in the district and to publish the information obtained broadcast.

Following that lead, twelve Wimmera and Mallee Societies now hold similar competitions. The Horsham Society as well has a seed selection competition, and this year has inaugurated a competition with a view to improving the grain sample of the district.

The continued success in public competition of crops grown by certain methods has pointed to their advantage. Summer fallowing was one such method brought into prominence; and the competitions have also been the means of practically standardizing the methods of working the fallows. But the greatest advantage of the work of the agricultural societies has been the opportunity afforded of demonstrating the success of the improved practices by direct personal illustration. One example

Farmers' Field Day—Government Experimental Plots, Warracknabeal.

serves to show what is meant. Two years ago a crop and fallow competition was started at Warracknabeal. It was noticed that the competitors were using less seed and manure per acre than had been proved profitable elsewhere. District farmers were, therefore, urged personally, as well as through the press, to increase their dressings of seed and fertilizer up to that level. This year a canvass showed that 20 competitors had increased seed by an average of 10 lbs. per acre, and superphosphate by 11 lbs.—that is practically up to the desired limit. And so with summer fallowing. Because summer-fallowed crops repeatedly won the competitions, large numbers of farmers had begun to practise the method and found it an advantage.

During the same period there was little corresponding activity among local agricultural bodies in the Northern District. There were no experimental fields there, and no organized method of ascertaining the best local practice and giving publicity to it. A question that naturally arises is: Does that not to some extent explain the smaller rate of progress there as illustrated by the average yield per acre? If the explanation suggested is the correct one, other districts—not only those in

the Wheat Belt—have much to gain if their local agricultural organizations will foster the discovery and propagation of new knowledge in their district.

Summary.

There is a remarkable difference between the average wheat yields obtained in certain counties in the Victorian Wheat Belt. Investigation shows that the high yields are associated with the adoption of specially efficient farming practices. In evolving these, scientists and leading farmers each play a part, and usually discover valuable facts far quicker than the general community can be induced to put them into practice. In districts where the biggest advances have been made, local agrcultural bodies are best organized. The great retarding force to the adoption of new practices is the traditional conservatism of the farming community. In overcoming that the organizations that lead local opinion play a most important part. The interplay of these factors controlling the rate at which improvement in agricultural efficiency takes place, are studied with reference to the Wimmera and the Northern Districts, which are similar in respect to rainfall and area sown to wheat. In 25 years the average yield of the Wimmera has been advanced 151 per cent., comparing five-year periods, while the corresponding increase in the Northern District is 32 per cent. For the greater part of the period the same scientific discoveries have been available to both districts, but in the Wimmera they have been adopted at a faster rate. In the last decade, during which time the yield of the Northern District has remained practically stationary, that of the Wimmera has been advanced by 4.3 bushels per acre. The period has been one of great activity in investigatory and propaganda work in the Wimmera, but little or nothing of a similar nature has been done by the Northern District. The results of the study suggest that in other districts the local agricultural organizations should endeavour to foster the discovery and propagation of new knowledge in their districts. Above all they should endeavour to create a greater receptivity in the minds of the people in their community to improved practices.

THE PROGRESS OF COUNTY-AGENT WORK IN THE UNITED STATES.

The great increase in the expenditure of county-agent work in the United States is indicated by the following little table from the United States Department Circular 179, which shows the amounts contributed by the various forms of government in the years 1915, 1917, and 1921, and the totals:—

Source.	1915.	1917.	1921.
	Dollars.	Dollars.	Dollars.
Federal	320,059	538,074	1,491,502
State	165,068	375,111	941,434
County	482,345	732,339	3,148,930
Total	967,472	1,627,524	5,581,666

REPORT OF ELEVENTH VICTORIAN EGG-LAYING COMPETITION, BURNLEY.

A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

FEATURES OF THE COMPETITION.

Returned Soldier's Success.

Perhaps one of the most pleasing features of the Eleventh Egg-laying Competition at Burnley was the success of a returned soldier poultry farmer, Mr. C. C. Langley, whose team of six White Leghorns won the wet-mash section with a total score of 1,394 eggs for the year. This success is a great tribute to Mr. Langley's own unbounded energy. Building up a successful poultry farm on limited capital is bound to call out all that is best in a man, and Mr. Langley has, in addition to working hard on his farm by day, worked in Melbourne nightly during the past few winters in order to earn money to build more sheds for his increasing flock. His team of birds were a remarkably even lot, as will be noted from the fact that the lowest score in the trap-nests was 226 and the highest 241.

Mr. C. C. Langley's Winning Team of White Leghorns in the Wet Mash Section. (1,394 eggs.)

[Dargo, Photo.

Improving the Type.

In their anxiety to secure eggs, there has been for several years past a tendency on the part of some breeders to ignore type, and the rule requiring all competing birds to be fair specimens of their breed had been somewhat liberally interpreted. At the commencement of this competition, however, the birds were more closely examined, with the result that 34 birds in all, representing almost 6 per cent., were disqualified on type. In view of the world-wide renown of the Victorian birds, this step was unavoidable, and the result is borne out in the new competition just commenced, wherein it has been necessary to disqualify only eight birds on type (about 1¼ per cent.).

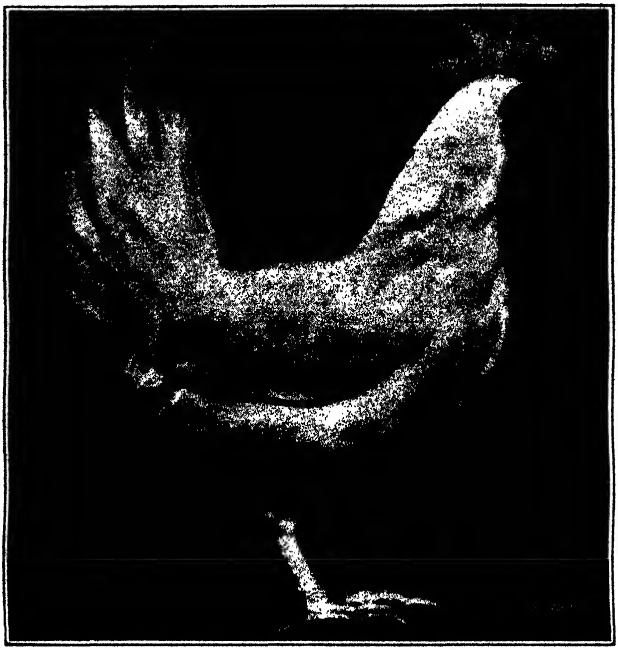
I must admit, frankly, that the question of real type is barely as clearly cut an issue as it should be, because exhibition poultry (like utility poultry) are quite as often judged on the whim of the judge as on the actual standard, nevertheless for the future at Burnley Egg-Laying Competition there must be no doubt in any one's mind as to what breed any competing bird really represents. Recently the news reached Australia that there has been formed in Great Britain an "Australorp" Club, with its own standard laid down by Mr. W. Powell Owen for the new (?) breed—Australorps! The so-called standard is replete with unconscious humour, and we in Australia trust that practical breeders in Great Britain will join with us (presently) in ignoring it. About the worst feature is the decision that any bird over 6 lbs. weight shall be disqualified. May I again point out that the Black Orpington owned by Mr. C. E. Graham, of Portarlington, weighed 6½ lbs. when she laid 335 eggs in official test in the year.

Mr. P. F. Marville's Winning Team of Black Orpingtons. (1,344 eggs.
[Darge, Photo.

Seeing that an Orpington pullet should weigh 7 lbs., and a hen 8 lbs., it is a pity to abnormally reduce the weight. At present, for Burnley, a six-months Black Orpington pullet must weigh not less than 5 lbs. to be admitted for competition.

The standard laid down recently by Mr. Powell Owen would automatically disqualify Mr. Graham's world-famous hen. As a matter of fact, the utility Orpington standard to-day in Victoria calls for the Orpington as originated by the late William Cook, and this fact was admitted and commented on by Mr. House, the well-known English writer and judge, when he went round the Burnley pens with me on 30th March last. Another distressing feature of the "Australorp" standard is the admission of purple barring. To my mind purple barring is most objectionable, and the Orpington standard calls for "green" sheen.

As regards our White Leghorns there is, in some quarters, a desire to have a weight limit of $3\frac{1}{2}$ lbs. imposed on admission to the competition. It should be borne in mind that these birds frequently come on lay at from four and a quarter to four and a half months old, and also that the journey to Burnley and subsequent change of environment are liable to put a bird off lay; consequently birds are usually sent to Burnley that are just about to start laying, with the result that somewhat immature birds are sent by some of the cleverest breeders. Even with slower maturity in the British climate (which means a slightly older bird at



Mr. N. Meyers' Winning Bird in the Dry Mash Single Test. (290 eggs.)
[Darge, Photo.

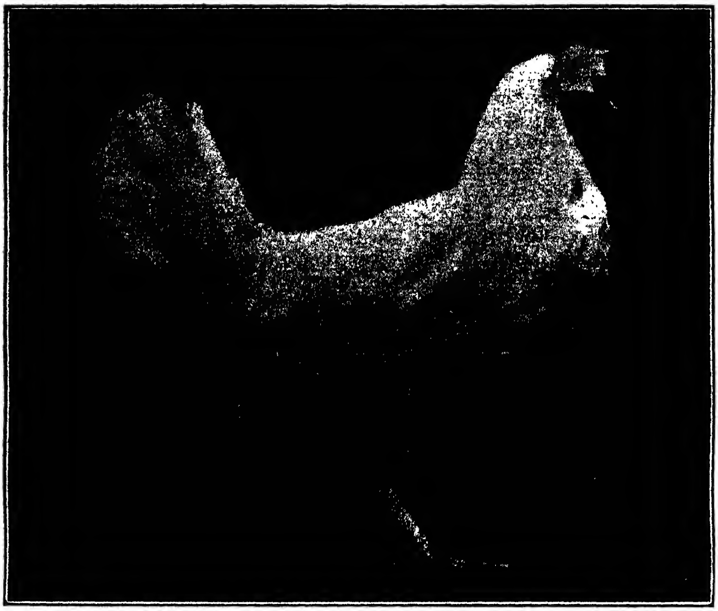
the commencement of laying), the competition limit at the biggest British competition—Harper Adams Agricultural College—is 3 lbs. for White Leghorns.

A further point is that many of the best American White Leghorns are considerably smaller than ours. New blood will be needed ere long, and it would be a pity to ban an importation of the best American laying strains.

Individual Performances.

Mr. Norman Meyers followed up his success in the previous competition by winning the White Leghorn Dry Mash Teams (trap-nest) with the useful score of 1,552, his best bird laying 282, and was also first in the Dry Mash Single Test, with 290, and equal second, with 285.

Mr. G. McDonnell, who had a phenomenal run of success at Burnley, was equal second with Mr. N. Meyers, with a score of 285, and won the



Messrs. Herbert Bros.' Trap-nest Winner. (299 eggs.)

Mr. N. Meyers' Winning Team of White Leghorns in the Dry Mash Section. (1,552 eggs.)

[Darge, Photos.

weight of eggs prize with an average of 25.469 ozs. per dozen for the whole year.

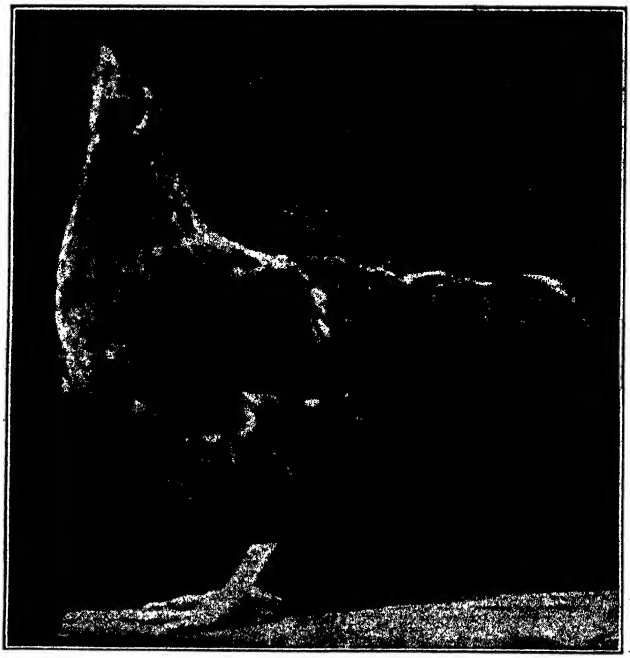
Messrs. Herbert Brothers were first and second in the White Leghorn Wet Mash Single Test with 293 and 282, and had a bird in the trap-nest section that scored 299; it was unfortunate that seven eggs were laid outside the trap-nests by the six birds, as otherwise the score might possibly have reached the 300 mark.

Mr. J. Ryan's Rhode Island Red laid the highest score for the competition, exactly 300 eggs.

Mr. J. Quinlan had a Black Orpington trap-nested for 296.

Mr. F. Gaskell had a White Leghorn trap-nested for 295.

Mr. A. Enticknap was again prominent with the good score of 1,541 for his team. Mr. W. A. Shevill and the Marville Poultry Farm won the two Black Orpington sections with scores of 1,475 and 1,344 respectively.



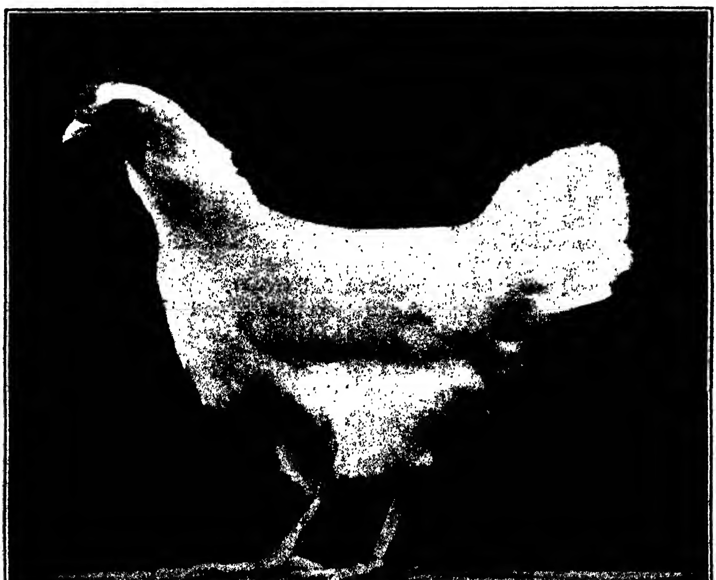
Mr. Jas. Ryan's Rhode Island Red. With the highest score for the competition (300 Eggs).

[Darge, Photo.

Financial Returns.

The birds averaged 212½ eggs per bird for the year.
Eggs laid averaged 1s. 9¾d. per dozen for the year.
The cost of food averaged 3¼d. per bird per week.
Return from sale of eggs, £1 12s. 0½d. per bird.
Less cost of feed, 14s. 1d. per bird.
Return over feed bill, 17s. 11½d. per bird for the year.

Mr. A. G. Stevens' Black Orpington—Winner of Single Test (284 eggs).



Kreira Poultry Farm's Rhode Island White (240 eggs).

[Darge, Photos

Eggs Laid Outside the Trap Nest.

Table III., on page 351, gives the percentages of eggs laid outside the trap-nests, while Tables I. and II., on pages 349 and 350, show the results for the two preceding years. Dr. Raymond Pearl expressed the opinion that 1 per cent. of eggs laid outside the trap-nests would probably be found to be the irreducible minimum, so that this year's returns—0.62 per cent.—not only probably constitute a world's record in accuracy, but are a greater tribute to the abilities of Mr. Macaulay and his assistants than any eulogy that I could write. Time will show whether this wonderful achievement can ever be beaten.

Mr. W. A. Shevill's Winning Team of Black Orpingtons in the Wet Mash Section (1,475 eggs).

[Darge, Photo.

Feeding System.

The birds were fed as follows:—

Wheat pollard and wheat bran equal parts, with about 10 per cent. oaten pollard, mixed with liver soup, and greenstuff added to the extent of about 30 per cent.

Greenstuff and raw chopped onions fed freely.

The dry mash is similar to the wet mash, but the greenstuff and meat are fed separately.

Weight of Eggs.

The prize for highest average weight of eggs was won by Mr. G. McDonnell, but there were too many pens just under the 24 ozs. per dozen throughout the year.

Eighteen pens laid over 24 ozs. to the dozen, 24 other pens laid over 23½ ozs. to the dozen, and five pens laid over 23 ozs. but under 23½ ozs.

This should be very carefully noted by the breeders, as it is most essential, if an export trade be firmly established, that 24 ozs. per dozen shall be the *irreducible minimum*, instead of actually the majority just failing to reach this standard.

It is of interest to note that Messrs. Herbert Brothers' White Leghorn wet-mash pen averaged 24.822 ozs. per dozen, whilst the same breeders' dry-mash fed team averaged 24.818 ozs. per dozen, which would indicate that the system of feeding either wet or dry mash has no direct bearing on the size of egg yielded, and these weights are quite satisfactory from an export point of view.

Single Test Criticism.

Pen		Score	
1.	..	155 eggs.	Round bone; flesh former.
2.	..	222 eggs.	Moulted unevenly; fair laying type.
3.	..	208 eggs.	Rather soft plumage.
4.	..	165 eggs.	Very broody; weak in front of eye.
5.	..	208 eggs.	Good head and feather; barely Rhode Island type.
6.	..	240 eggs.	Better type, nice quality throughout.
7.	..	203 eggs.	Fair type.
8.	..	188 eggs.	Spoilt by broodiness.
9.	..	138 eggs.	Too light in eye; trifle weak in stamina.
10.	..	176 eggs.	Poor colour; heavy skull; rather cloddy type.
11.	..	234 eggs.	On the small side; twice broody.
12.	..	166 eggs.	Coarse style, fails in front.
13.	..	211 eggs.	Decent type, but poor colour; went broody.
14.	..	235 eggs.	Fair type, uneven colour; went broody.
15.	..	247 eggs.	Lacks type, fails in front; went broody.
16.	..	300 eggs.	Nice type, excellent face, and plenty of stamina.
17.	..	196 eggs.	Close feather, but barely up to type; lacks balance.
18.	..	58 eggs.	Sour, wrinkled face; plumage lacks sheen.
19.	..	79 eggs.	Very soft in feather, but should have done better.
20.	..	190 eggs.	Hollow and weak face.
21.	..	200 eggs.	Fair Orpington type; poor comb; went broody.
22.	..	235 eggs.	Soft feather, leans slightly to Minorca type.
23.	..	233 eggs.	Close feather, rather on small side but weighty; lays a good egg.
24.	..	221 eggs.	Weak face; went broody.
25.	..	161 eggs.	Been ill; lays a good sized egg.
26.	..	259 eggs.	Very nice hen, good bone and face.
27.	..	203 eggs.	Close feather, but rather heavy skull.
28.	..	201 eggs.	Decent sort of hen; moulted early.
29.	..	205 eggs.	Whitish lobes; insufficient webbing in feather.
30.	..	184 eggs.	Good face; persistent broody.
31.	..	220 eggs.	Was sick early in the competition; rather coarse skull.
32.	..	267 eggs.	Good feather and bone, type could be improved.
34.	..	154 eggs.	Loose feather.
35.	..	269 eggs.	Good face and feather, splendid body, lays good egg.
36.	..	208 eggs.	Weak in type.
37.	..	264 eggs.	Good bone, fair face; feather rather loose but well webbed.
38.	..	208 eggs.	Fair type; rather pale face generally.
39.	..	260 eggs.	Good strong head and bone; went broody.
40.	..	—	Returned.
41.	..	222 eggs.	Good head and bone; purple sheen on feathers.
42.	..	260 eggs.	Good hen throughout; moulted.
43.	..	174 eggs.	Strong hardy bird; very heavily feathered.
44.	..	223 eggs.	Lightish eye; heavily feathered.
45.	..	210 eggs.	Good head and bone; moulted early; went broody.
46.	..	208 eggs.	Rather heavy bone; close feather.
47.	..	176 eggs.	Thick in head; sunken eye.
48.	..	174 eggs.	Barely up to type.
49.	..	156 eggs.	Nice hen; very broody.
50.	..	220 eggs.	Persistent broody.
51.	..	171 eggs.	Poor colour; trifle coarse.
52.	..	193 eggs.	Close feather; persistent broody.
53.	..	256 eggs.	Hardy sort; neat head; went broody.

SINGLE TEST CRITICISM—*continued.*

Pen		Score	
54.	..		
55.	..	193 eggs.	Good Orpington type, but loose feather.
56.	..	155 eggs.	Dull; not a layer.
57.	..	284 eggs.	Nice face and eye.
58.	..	280 eggs.	Very good face and eye, but on the light side for a breeder.
59.	..	232 eggs.	Rather light throughout, though nice face and eye.
60.	..	183 eggs.	Fair class of hen; went broody.
61.	..	221 eggs.	Solid type of hen, rather weak skull for her size, whitish lobes.
62.	..	223 eggs.	Good type for breeding; moulted rather early.
63.	..		
64.	..	213 eggs.	Good hen; moulted early.
65.	..	224 eggs.	Continually broody, otherwise a nice sort.
66.	..		
67.	..	151 eggs.	Weak in type; coarse skull.
68.	..	207 eggs.	Fair sort; went broody.
69.	..	178 eggs.	Rather weak Orpington type.
70.	..	212 eggs.	Good style of hen; went broody.
71.	..	252 eggs.	Close feather, strong constitution, inclined to be weak in face.
72.	..	—	Died.
73.	..	251 eggs.	Slow in starting to lay; good useful sort to breed from.
74.	..	195 eggs.	Persistent broody.
75.	..	213 eggs.	Nice type; both went broody.
76.	..	237 eggs.	
77.	..	160 eggs.	Sour face; out of balance.
78.	..	124 eggs.	Likely layer. *Score unaccountable.*
79.	..	245 eggs.	Nice head and feather, but narrow over the saddle.
80.	..	178 eggs.	Rather flat face, with soft feather.
81.	..	269 eggs.	Small, but good type.
82.	..	254 eggs.	Soft feather; early moult spoilt the score.
83.	..	270 eggs.	Soft feather, but good head.
84.	..	272 eggs.	Rather narrow across the saddle.
85.	..	227 eggs.	Racy sort; moulted early.
86.	..	155 eggs.	Good appetite, inclined to lay on flesh.
87.	..	176 eggs.	Moulted twice.
88.	..	248 eggs.	Hard feather; racy type.
89.	..	259 eggs.	A nice sort; good feather; lays good sized egg.
90.	..	247 eggs.	Good useful sort.
91.	..	279 eggs.	Rather light for stud purposes; went broody.
92.	..	243 eggs.	Fair average hen.
93.	..	270 eggs.	Nice sort to breed from; lays good sized egg.
94.	..	240 eggs.	Good type; strong hen throughout.
95.	..	263 eggs.	On the small side, otherwise nice type.
96.	..	255 eggs.	A trifle soft in feather.
97.	..	171 eggs.	None too robust.
98.	..	107 eggs.	Good laying type. *Score unaccountable.*
99.	..	233 eggs.	Good type to breed from.
100.	..	236 eggs.	Weak face.
101.	..	261 eggs.	A good performer; moulted early.
102.	..	206 eggs.	Lacks stamina.
103.	..	184 eggs.	Moulted early.
104.	..	146 eggs.	Broody.
105.	..	236 eggs.	Fair laying sort of questionable ancestry.
106.	..	265 eggs.	
107.	..	252 eggs.	Nice laying type.
108.	..	285 eggs.	Good laying type. A cold probably spoilt a still better score.
109.	..	216 eggs.	Moulted early; soft feather.
110.	..	273 eggs.	Good type throughout.
111.	..	268 eggs.	Rather narrow behind, otherwise nice type.
112.	..	264 eggs.	Good body and type.
113.	..	285 eggs.	Sound, hardy, laying type; valuable breeders.
114.	..	290 eggs.	
115.	..	238 eggs.	Rather weak face.

SINGLE TEST CRITICISM—*continued.*

Pen		Score	
116.	..	230 eggs.	A bit small to breed from.
117.	..	257 eggs.	Hardy, but both on the small side.
118.	..	263 eggs.	
119.	..	271 eggs.	Good laying type ; close feather.
120.	..	253 eggs.	Not so close in feather ; cuts away in front.
121.	..	220 eggs.	Moulted on arrival ; good type.
122.	..	276 eggs.	Vigorous breeder.
123.	..	214 eggs.	Soft feather.
124.	..	251 eggs.	Looks better than her score.
125.	..	263 eggs.	Inclined to be weak in face.
126.	..	139 eggs.	Indifferent health.
127.	..		
128.	..		
129.	..	237 eggs.	Looks worth a higher score.
130.	..	252 eggs.	Good type ; moulted early.
131.	..	258 eggs.	Rather flat sided ; moulted early.
132.	..	267 eggs.	Hardly the type, but very good feather and bone.
133.	..	153 eggs.	Lacks stamina.
134.	..	226 eggs.	Just a bit small.
135.	..	30 eggs.	Bad health.
136.	..	223 eggs.	Indifferent type.
137.	..	209 eggs.	Broke down early.
138.	..	96 eggs.	*Score unaccountable.*
139.	..	224 eggs.	Moulted early.
140.	..	237 eggs.	Good type, but soft feather.
141.	..	—	Died.
142.	..	241 eggs.	Rather small for breeding purposes.
143.	..	161 eggs.	Good size, but very soft feather.
144.	..	259 eggs.	Hard feather, but just fair type.
145.	..	182 eggs.	Soft in feather.
146.	..	241 eggs.	Good body ; nice type.
147.	..	244 eggs.	Good hardy sort throughout.
148.	..	249 eggs.	Good face and eye ; close feather.
149.	..	—	Moulted early; very fast layer.
150.	..	238 eggs.	Weak in type.
151.	..	91 eggs.	Looks good sort of hen. *Score unaccountable.*
152.	..	235 eggs.	Good feather ; splendid body.
153.	..	213 eggs.	Loose feather ; rather flat face.
154.	..	195 eggs.	Loose feather ; not strong enough constitution.
155.	..	218 eggs.	Sour face ; good feather.
156.	..	236 eggs.	Fair face and eye.
157.	..	178 eggs.	Good size ; rather soft feather.
158.	..	216 eggs.	Barely up to type.
159.	..	234 eggs.	Fair class of hen ; rather narrow front.
160.	..	258 eggs.	Good head ; narrow throughout.
161.	..	223 eggs.	Weak face ; a bit small.
162.	..	237 eggs.	Decent sort, but soft feather.
163.	..	239 eggs.	Good breeding type, but rather soft feather.
164.	..	159 eggs.	A bit flat sided.
165.	..	—	Died.
166.	..	166 eggs.	Narrow behind.
167.	..	224 eggs.	Fair sort, somewhat narrow in front ; inclined to lay soft shelled eggs.
168.	..	153 eggs.	Fails in front ; soft feather.
169.	..	149 eggs.	Weak in type and colour.
170.	..	161 eggs.	Narrow behind.
171.	..	208 eggs.	Flat face ; narrow across the saddle.
172.	..	187 eggs.	Soft feather.
173.	..	247 eggs.	Fair body ; rather weak face.
174.	..	—	Died.
175.	..	181 eggs.	Should have done better : fair sort.
176	..	183 eggs.	Sour face.

Single Test Criticism—*continued.*

Pen		Score	
177.	..	125 eggs.	Soft feather; over fine in texture.
178.	..	128 eggs.	
179.	..	190 eggs.	Both too light.
180.	..	209 eggs.	
181.	..	180 eggs.	Looks better than her score.
182.	..	98 eggs.	Too fine; soft feather.
183.	..	147 eggs.	Both moulted twice.
184.	..	183 eggs.	
185.	..	207 eggs.	Trifle gamely; narrow behind.
186.	..	207 eggs.	Good sized egg; rather narrow behind.
187.	..	156 eggs.	Sour face; beefy type.
188.	..	220 eggs.	Weak type.
189.	..	205 eggs.	Over fine in skull.
190.	..	146 eggs.	Weak type.
191.	..	173 eggs.	Cuts away in front.
192.	..	241 eggs.	Fair type; hardy sort.
193.	..	233 eggs.	Fair head, but out of balance.
194.	..	229 eggs.	Poor type.
195.	..	224 eggs.	Tall and narrow.
196.	..	238 eggs.	
197.	..	145 eggs.	Soft in feather; moulted twice.
198.	..	177 eggs.	
199.	..	235 eggs.	Good face, but weedy sort.
200.	..	210 eggs.	Weak face; soft feather.
201.	..	182 eggs.	Flat face.
202.	..	261 eggs.	Hard feather; good skull.
203.	..	226 eggs.	Sour face.
204.	..	177 eggs.	Good feather, but narrow behind.
205.	..	177 eggs.	Fair feather; cuts away in front.
206.	..	130 eggs.	Strong bodied hen, inclined to beefiness.
207.	..	201 eggs.	Weedy sort.
208.	..	221 eggs.	Good feather, but narrow behind.
209.	..	208 eggs.	Decent body, but rather flat face.
210.	..	227 eggs.	Good feather; poor body.
211.	..	236 eggs.	Too light.
212.	..	245 eggs.	Nice face, but rather small for stud purposes.
213.	..	235 eggs.	Barely up to size.
214.	..	142 eggs.	Moulted twice; very soft feather.
215.	..	260 eggs.	Fair Leghorn type; very close feather.
216.	..	218 eggs.	Moulted early.
217.	..	268 eggs.	Both nice typs of hens.
218.	..	257 eggs.	
219.	..		
220.	..		
221.	..	205 eggs.	Poor type, and under size.
222.	..	248 eggs.	Good score, but too small to breed from.
223.	..	239 eggs.	Rather too fine.
224.	..	142 eggs.	Narrow throughout.
225.	..	273 eggs.	Hard feather.
226.	..	262 eggs.	Nice body, but narrow in front.
227.	..	254 eggs.	Good strong sort.
228.	..	189 eggs.	Weak face, barely up to type.
229.	..	118 eggs.	Very weak face.
230.	..	258 eggs.	Good face; hard feather; fair body.
231.	..	293 eggs.	Good hen all round; a valuable breeder
232.	..	282 eggs.	Nice head and feather, a trifle small.
233.	..	210 eggs.	Good type; soft feather.
234.	..	208 eggs.	Lacks type.
235.	..	145 eggs.	Inclined to flesh; high on the leg.
236.	..	194 eggs.	A medium sort throughout.

TABLE I.

Monthly Results 1919-20 Competition.

PERCENTAGES OF EGGS LAID OUTSIDE THE TRAP-NESTS.

	Light Breeds—Wet Mash.			Light Breeds—Dry Mash.			Heavy Breeds—Wet Mash.			Heavy Breeds—Dry Mash.			Weighted Average.		
	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Total Eggs Laid.	Un-allotted.	Per cent. Un-allotted.
April .. .. .. (1–30, 30 days)	3,245	301	9·27	1,417	177	12·49	1,329	387	29·11	766	190	24·93	6,757	1,055	15·61
May .. .. .. (1–28, 28 days)	3,138	154	4·90	1,616	177	10·95	1,528	246	16·09	1,013	160	15·79	7,295	737	10·10
June .. .. .. (May 19–July 2, 35 days)	3,881	247	6·36	2,014	129	6·4	2,391	312	13·04	1,425	140	9·82	9,711	828	8·52
July .. .. .. (July 3–31, 29 days)	3,561	181	5·08	2,101	67	3·18	1,986	203	10·22	1,089	76	6·42	8,737	527	6·03
August .. .. (Aug. 1–Sept. 3, 34 days)	4,425	81	1·83	3,174	35	1·10	1,689	3	0·17	1,592	66	4·16	10,880	185	1·70
September .. .. (Sept. 4–Oct. 1, 28 days)	5,004	25	0·49	2,920	4	0·13	2,045	9	0·44	1,304	1	0·07	11,273	39	0·34
October .. .. (2–29, 28 days)	4,935	10	0·20	2,903	3	0·10	1,873	9	0·48	1,212	6	0·49	10,923	28	0·25
November .. .. (Oct. 30–Nov. 26, 28 days)	4,792	12	0·25	2,741	18	0·65	1,661	23	1·38	1,020	15	1·47	10,214	68	0·66
December .. .. (Nov. 27–Dec. 31, 35 days)	5,435	24	0·44	3,290	14	0·42	1,881	17	0·90	1,088	18	1·65	11,694	73	0·62
January .. .. (1–29, 29 days)	4,033	27	0·66	2,311	15	0·64	1,433	29	2·02	796	24	3·01	8,573	95	1·10
February .. .. (Jan. 30–Feb. 25, 27 days)	4,019	30	0·74	2,175	10	0·45	1,352	12	0·88	780	6	0·77	8,326	58	0·69
March .. .. .. (Feb. 26–March 31, 35 days)	4,010	11	0·27	2,214	4	0·18	1,401	4	0·28	875	5	0·57	8,500	24	0·28
Total	50,478	1,103	2·18	28,876	653	2·26	20,569	1,254	6·09	12,960	707	5·45	112,883	3,717	3·29

TABLE II.

Monthly Results, 1920-21 Competition.

PERCENTAGES OF EGGS LAID OUTSIDE THE TRAP-NESTS.

	Light Breeds—Wet Mash.			Light Breeds—Dry Mash.			Heavy Breeds—Wet Mash.			Heavy Breeds—Dry Mash.			Weighted Average.		
	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Total Eggs Laid.	Un-allotted.	Per cent. Un-allotted.
April .. .. .. (1–28, 28 days)	2,080	56	2·69	814	23	2·83	980	18	1·84	515	8	1·55	4,389	105	2·39
May .. .. .. (Apr. 29–June 2, 35 days)	2,722	23	0·84	1,128	7	0·62	1,375	16	1·16	701	1	0·14	5,926	47	0·79
June .. .. .. (June 3–30, 28 days)	2,453	14	0·57	1,049	6	0·57	1,543	12	0·78	587	1	0·17	5,632	33	0·59
July .. .. .. (July 1–28, 28 days)	2,571	29	1·13	1,383	4	0·29	1,771	19	1·07	669	1	0·15	6,394	53	0·83
August .. .. (July 29–Sept. 1, 35 days)	3,850	15	0·39	1,841	3	0·16	2,424	4	0·17	901	2	0·22	9,016	24	0·27
September .. .. (Sept. 2–29, 28 days)	3,594	15	0·42	1,686	3	0·18	1,954	7	0·36	612	..	0·0	7,846	25	0·32
October .. .. (Sept. 30–Oct. 27, 28 days)	3,666	10	0·27	1,721	6	0·35	1,849	13	0·70	577	5	0·87	7,813	34	0·44
November .. .. (Oct. 28–Dec. 1, 35 days)	4,234	2	0·28	2,099	6	0·29	1,816	4	0·22	499	..	0·0	8,648	22	0·25
December .. .. (Dec. 2–Jan. 5, 35 days)	3,567	42	1·18	1,853	17	0·92	1,517	50	3·30	469	14	2·99	7,406	123	1·66
January .. .. (Jan. 6–Feb. 2, 28 days)	2,651	21	0·79	1,448	8	0·55	1,189	29	2·44	456	2	0·44	5,744	60	1·04
February .. .. (Feb. 3–Mar. 2, 28 days)	2,305	22	0·95	1,211	12	0·99	1,109	19	1·71	187	2	1·07	4,812	55	1·04
March .. .. .. (3–31, 29 days)	1,773	27	1·52	948	5	0·53	1,034	8	0·77	304	1	0·33	4,059	41	1·01
Total	35,466	286	0·81	17,181	100	0·58	18,561	199	1·07	6,477	37	0·57	77,685	622	0·80

TABLE III.

Monthly Results, 1921-22 Competition.

PERCENTAGES OF EGGS LAID OUTSIDE THE TRAP-NESTS.

	Light Breeds—Wet Mash.			Light Breeds—Dry Mash.			Heavy Breeds—Wet Mash.			Heavy Breeds—Dry Mash.			Weighted Average.		
	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted.	Per cent. Un-allotted.	Eggs Laid.	Un-allotted	Per cent. Un-allotted.	Total Eggs Laid.	Un-allotted.	Per cent. Un-allotted.
April .. .. .. (April 1–May 4, 34 days)	2,007	40	1·99	766	26	3·39	2,045	100	4·89	741	15	2·02	5,559	181	3·25
May .. .. .. (May 5–June 1, 28 days)	1,897	8	0.42	846	2	0.24	1,927	28	1.45	630	..	0.0	5,300	38	0.72
June .. .. .. (2–29, 28 days)	1,511	8	0.53	612	4	0·65	2,066	9	0·43	600	..	0·0	4,789	21	0·44
July .. .. .. (June 30–July 31, 32 days)	1,903	17	0.89	1,004	8	0.80	2,469	12	0.49	708	3	0·42	6,084	40	0·66
August .. .. (1–31, 31 days)	2,375	10	0·42	1,150	6	0·52	2,354	4	0.17	623	..	0·0	6,502	20	0·31
September .. .. (1–28, 28 days)	2,291	..	0·0	1,156	1	0·09	2,103	5	0.24	557	..	0·0	6,107	6	0·10
October .. .. (Sept. 29–Nov. 2, 35 days)	2,871	3	0·10	1,432	..	0·0	2,495	5	0·2	617	2	0·32	7,415	10	0·13
November .. .. (3–30, 28 days)	2,254	2	0·09	1,049	2	0·19	1,736	4	0·23	431	1	0·23	5,470	9	0·16
December .. .. (Dec. 1–Jan. 4, 35 days)	2,600	15	0·58	1,283	3	0·23	2,096	7	0·33	551	..	0·0	6,530	25	0·38
January .. .. (Jan. 5–Feb. 1, 28 days)	1,593	4	0.25	793	6	0.76	1,428	5	0·35	378	1	0·26	4,192	16	0·38
February .. .. (Feb. 2–March 1, 28 days)	1,463	8	0·55	853	7	0·82	1,329	10	0·75	336	2	0·59	3,981	27	0.68
March .. .. .. (2–31, 30 days)	1,198	8	0·67	755	1	0·13	1,431	5	0·35	425	..	0·0	3,809	14	0.37
Total	23,963	123	0·51	11,699	66	0·56	23,479	194	0·83	6,597	24	0·36	65,738	407	0.62

FINAL RESULTS.

RECORD OF EGGS LAID DURING PERIOD OF COMPETITION, 1st APRIL, 1921, to 31st MARCH, 1922.

Section A.—Groups of Six Birds Trapnested.

Pen No.	Competitor.	Hen. 1.	2.	3.	4.	5.	6.	(x).	Total to 31st March, 1922.
	Class 1.—Light Breeds (White Leghorns), Wet Mash.								
44	C. C. Langley ..	228	226	234	223	241	240	2	1,394
32	A. Scott ..	165	220	250	203	251	200	9	1,298
49	J. P. Brown ..	207	239	159	207	235	219	4	1,270
37	G. Pocknall ..	200	186	(*d*) 154	233	233	247	5	1,258
48	E. A. Lawson ..	221	180	227	195	213	199	2	1,237
36	T. A. Pettigrove ..	193	182	218	215	206	197	6	1,217
45	Norman Meyers ..	195	211	208	177	213	202	2	1,208
34	J. G. Alston ..	223	198	226	73	247	214	11	1,192
42	Deepspring Poultry Farm ..	206	183	191	246	124	229	7	1,186
52	D. Gibson ..	240	191	182	214	162	157	8	1,154
38	Herbert Bros. ..	240	244	(*d*) 25	229	187	222	6	1,153
46	J. H. Chirnside ..	208	189	17	155	169	245	11	1,149
33	U.O.I. Poultry Farm	186	189	188	190	194	193	9	1,149
43	Harry Miller ..	216	187	220	182	(*d*) 43	254	1	1,103
51	Miss M. T. Kidd ..	165	(*d*) 111	170	214	232	204	2	1,098
47	Clee Hill Stud Poultry Farm ..	210	192	152	(*d*) 54	240	237	2	1,087
39	P. N. Tilley ..	221	206	154	111	155	208	24	1,079
31	F. Gaskell ..	181	210	214	199	248	7	1	1,060
35	A. McCall ..	224	170	136	147	186	185	3	1,051
40	R. Moore ..	140	197	133	95	171	174	4	914
41	G. B. Brown and Son	130	178	(*d*) —	159	57	178	4	706
	Class 2.—Light Breeds (White Leghorns), Dry Mash.								
62	Norman Meyers ..	231	255	255	282	266	259	4	1,552
59	A. Enticknap ..	248	269	227	287	239	260	11	1,541
63	G. McDonnell ..	223	174	232	240	236	221	1	1,327
56	Deepspring Poultry Farm ..	210	234	200	239	219	206	5	1,313
60	Herbert Bros. ..	256	233	254	212	117	182	8	1,262
54	Chas. Ridley ..	251	(*d*) 181	217	217	(*d*) 123	233	9	1,231
3	B. Brown ..	(*d*) 99	263	(*d*) 151	201	237	216	19	1,186
	F. Gaskell ..	295	233	213	176	151	(*d*) 74	4	1,146
	A. McCall ..	200	241	197	173	222	(*d*) 103	5	1,141
	Class 3.—Heavy Breeds (Black Orpingtons), Wet Mash.								
	W. A. Shevill ..	238	225	192	251	286	275	8	1,475
3	Frank Harrison ..	201	260	269	211	260	228	..	1,429
5	D. W. Ilton ..	273	258	210	166	238	223	8	1,376
9	S. Andrew ..	236	243	112	250	265	249	3	1,358
80	J. Quinlan	199	296	238	226	275	(*d*) 86	5	1,325

NOTE.—Eggs laid outside nest denoted thus (x).
Death of birds marked thus (*d*).

FINAL RESULTS—*continued.*

SECTION A.—GROUPS OF SIX BIRDS TRAPNESTED—*continued.*

Pen No.	Competitor.	Hen. 1.	2.	3.	4.	5.	6.	(x).	Total to 31st March, 1922.
	Class 3.—Heavy Breeds (Black Orpingtons), Wet Mash—*continued.*								
85	Wanchai Poultry Farm ..	167	198	207	243	260	228	9	1,312
70	C. B. Bertelsmeier	182	203	199	225	222	267	10	1,308
77	Herbert Bros. ..	190	257	182	235	105	299	7	1,275
74	C. E. Graham ..	197	191	111	279	166	225	32	1,201
65	Clee Hill Stud Poultry Farm ..	235	244	178	186	(*d*) 149	187	11	1,190
71	Louis Currie ..	226	234	233	55	205	229	7	1,189
66	R. R. Christie ..	160	247	231	(*d*) ..	228	219	5	1,090
78	L. W. Parker ..	46	239	157	205	183	220	12	1,062
86	Jas. A. Dunn ..	..	250	218	145	211	233	1	1,058
68	A. H Mould ..	186	177	208	..	168	143	2	884
88	Deepspring Poultry Farm ..	(*d*) 148	188	141	127	268	..	2	874
84	Mrs. N. Pearson ..	192	156	..	270	204	..	1	823
67	J. Wear.. ..	..	211	151	..	191	255	3	811
83	Marville Poultry Farm ..	112	..	238	..	(*d*) 206	230	1	787
76	J. C. Mickelburough	..	224	238	239	..	..	..	701
	Class 4.—Heavy Breeds (Black Orpingtons), Dry Mash.								
92	Marville Poultry Farm ..	252	213	234	223	252	164	6	1,344
94	J. C. Mickelburough	252	..	200	279	215	250	..	1,196
89	R. R. Christie ..	213	176	220	154	204	218	7	1,192
91	Clee Hill Stud Poultry Farm ..	..	216	220	236	196	192	1	1,061
88	Jas. A. Dunn ..	227	240	258	218	..	..	..	943

NOTE.—Eggs laid outside nest denoted thus (x).
Death of birds marked thus (*d*).

Section B.—Individual Birds.

Pen No.	Competitor.	Breed.	Total to 31st March, 1922.	Pen No.	Competitor.	Breed.	Total to 31st March, 1922.
	Class 1.—Leghorns, Wet Mash (All White Leghorns, except pens 169-170, Brown Leghorns).						
231	Herbert Bros. ..	White Leghorns	293	131	W. Cullen ..	White Leghorns	258
232	Herbert Bros. ..	,,	282	218	H. Groves ..	,,	257
149	F. Crafts ..	,,	281	227	G. McCutchan ..	,,	254
225	Geo. White ..	,,	273	130	A. O. Clifford ..	,,	252
217	H. Groves ..	,,	268	148	M. Whitley ..	,,	249
132	W. Cullen ..	,,	267	222	R. E. Exelby ..	,,	248
226	G. White ..	,,	262	173	C. D. Marshall	,,	247
202	H. Williams ..	,,	261	212	Chas. Ridley ..	,,	245
215	Woyna Poultry Farm	,,	260	147	M. Whitley ..	,,	244
				192	W. White ..	,,	241
144	F. Wight ..	,,	259	146	Woorayl Poultry Farm	,,	241
230	J. B. Nicoll ..	,,	258				
160	William Vercoe	,,	258	142	G. F. Walbran	,,	241

FINAL RESULTS—*continued.*

SECTION B.—INDIVIDUAL BIRDS—*continued.*

CLASS 1.—LEGHORNS, WET MASH—*continued.*

Pen No.	Competitor.	Breed.	Total to 31st March, 1922.
223	T. A. Pettigrove	White Leghorns	239
163	F. Gaskell ..	,,	239
196	A. Enticknap ..	,,	238
150	F. Crafts ..	,,	238
162	W. Godden ..	,,	237
140	Robt. Mathieson	,,	237
129	A. O. Clifford ..	,,	237
211	Chas. Ridley ..	,,	236
156	Fairy Mede Pens	,,	236
213	G.G. Stud Farm	,,	235
199	O. Godden ..	,,	235
152	H. B. James ..	,,	235
159	Wm. Vercoe ..	,,	234
193	T. Backoeller ..	,,	233
194	T. Backoeller ..	,,	229
210	P. N. Tilley ..	,,	227
203	Wanchai Poultry Farm	,,	226
134	J. H. Duncan ..	,,	226
195	A. Enticknap ..	,,	224
167	A. G. Stevens ..	,,	224
139	Robt. Mathieson	,,	224
161	W. Godden ..	,,	223
136	A. Siede and Sons	,,	223
208	H. W. Smith ..	,,	221
188	McCormack and Kinzell	,,	220
216	Woyna Poultry Farm ..	,,	218
155	Fairy Mede Pens	,,	218
158	Clee Hill Stud Poultry Farm	,,	216
153	E. A. Lawson ..	,,	213
233	Wm. G. Werry	,,	210
200	O. Godden ..	,,	210
180	Jack Ryan ..	,,	209
137	Britannia Poultry Farm	,,	209
234	Wm. G. Werry	,,	208
209	P. N. Tilley ..	,,	208
171	W. Plaw ..	,,	208
186	Norman Meyers	,,	207
185	Norman Meyers	,,	207
221	R. E. Exelby ..	,,	205
189	J. P. Brown ..	,,	205
207	H. W. Smith ..	,,	201
154	E. A. Lawson ..	,,	195
236	I. Maynard ..	,,	194
179	Jack Ryan ..	,,	190
228	G. McCutchan ..	,,	189
172	W. Plaw ..	White Leghorns	187
184	H. C. Clark ..	,,	183
176	W. C. E. St. Quintin	,,	183
201	H. Williams ..	,,	182
145	Woorayl Poultry Farm	,,	182
175	W. C. E. St. Quintin	,,	181
181	R. Roche ..	,,	180
157	Clee Hill Stud Poultry Farm	,,	178
205	J. Ogilvie ..	,,	177
204	Wanchai Poultry Farm ..	,,	177
198	L. Faulkner ..	,,	177
191	W. White ..	,,	173
166	G. B. Brown and Son	,,	166
170	J. C. Mickelburough	,,	161
143	F. Wight ..	,,	161
164	F. Gaskell ..	,,	159
187	McCormack and Kinzel	,,	156
168	A. G. Stevens ..	,,	153
133	J. H. Duncan ..	,,	153
165	G. B. Brown and Son	,, (*d*)	151
169	J. C. Mickelburough	,,	149
183	H. C. Clark ..	,,	147
190	J. P. Brown ..	,,	146
235	I. Maynard ..	,,	145
197	L. Faulkner ..	,,	145
224	T. A. Pettigrove	,,	142
214	G.G. Stud Farm	,,	142
141	G. F. Walbran	,, (*d*)	133
206	J. Ogilvie ..	,,	130
174	C. D. Marshall	,, (*d*)	130
178	H. and A. Woodman	,,	128
177	H. and A. Woodman	,,	125
229	J. B. Nicoll ..	,,	118
182	R. Roche ..	,,	98
138	Britannia P.F.	,,	96
151	H. B. James ..	,,	91
135	A. Siede and Sons	,,	30

NOTE.—Deaths of birds marked thus (*d*).

FINAL RESULTS—*continued.*

SECTION B.—INDIVIDUAL BIRDS—*continued.*

Class 2.—Leghorns, Dry Mash (All White Leghorns, except Pens 103-104, Brown Leghorns).

Pen No.	Competitor.	Breed.	Total to 31st March, 1922.	Pen No.	Competitor.	Breed.	Total to 31st March, 1922.
114	Norman Meyers	White Leghorns	290	88	I. Maynard ..	White Leghorns	248
113	Norman Meyers	,,	285	90	Britannia Poultry Farm	,,	247
108	G. McDonnell ..	,,	285	79	A. Siede and Sons	,,	245
91	J. H. Duncan ..	,,	279	92	J. H. Duncan ..	,,	243
122	J. Ogilvie ..	,,	276	94	F. Gaskell ..	,,	240
84	H. W. Smith ..	,,	274	115	G. F. Walbran	,,	238
110	Deep Spring Poultry Farm	,,	273	105	J. B. Nicoll ..	,,	236
83	H. W. Smith ..	,,	272	100	T. A. Pettigrove	,,	236
119	J. H. Morgan ..	,,	271	199	T. A. Pettigrove	,,	233
93	F. Gaskell ..	,,	270	116	G. F. Walbran	,,	230
81	Jack Ryan ..	,,	269	85	E. A. Lawson ..	,,	227
111	Herbert Bros. ..	,,	268	121	J. Ogilvie ..	,,	220
106	J. B. Nicoll ..	,,	265	109	Deepspring Poultry Farm	,,	216
112	Herbert Bros. ..	,,	264	123	W. White ..	,,	214
125	P. N. Tilley ..	,,	263	102	R. C. Brett ..	,,	206
95	T. Backcoller ..	,,	263	103	J. C. Mickleburough	,,	184
118	A. Enticknap ..	,,	263	80	A. Siede and Sons	,,	178
101	R. C. Brett ..	,,	261	87	I. Maynard ..	,,	176
89	Britannia Poultry Farm	,,	259	97	Chas. Ridley ..	,,	171
117	A. Enticknap ..	,,	257	86	E. A. Lawson ..	,,	155
96	T. Backcoller ..	,,	255	104	J. C. Mickelburough	,,	146
82	Jack Ryan ..	,,	254	126	P. N. Tilley ..	,,	139
120	J. H. Morgan ..	,,	253	98	Chas. Ridley ..	,,	107
107	G. McDonnell ..	,,	252				
124	W. White ..	,,	251				

Class 4.—Orpingtons, Any Colour, Wet Mash (Black Orpingtons, except Pens 67-68, Buff Orpingtons).

Pen No.	Competitor.	Breed.	Total to 31st March, 1922.	Pen No.	Competitor.	Breed.	Total to 31st March, 1922.
57	A. G. Stevens ..	Black Orpingtons	284	76	Marville Poultry Farm	Black Orpingtons	237
58	A. G. Stevens ..	,,	280	22	Chanticleer Poultry Yards	,,	235
35	Maypole Poultry Farm	,,	269	23	E. A. Lawson ..	,,	233
32	S. Andrew ..	,,	267	59	J. B. Nicoll ..	,,	232
37	Woorayl Poultry Farm	,,	264	65	Clee Hill Stud P.F.	,,	224
42	F. Telfer ..	,,	260	44	R. C. Brett ..	,,	223
39	W. Cullen ..	,,	260	62	J. P. Brown ..	,,	223
26	C. C. Dunn ..	,,	259	41	F. Telfer ..	,,	222
53	Robt. Mathieson	,,	256	61	J. P. Brown ..	,,	221
71	C. E. Graham ..	,,	252	24	E. A. Lawson ..	,,	221
73	A. Siede and Sons	,,	251	31	S. Andrew ..	,,	220

NOTE.—Death of birds marked thus (*d*).

FINAL RESULTS—*continued.*

SECTION B.—INDIVIDUAL BIRDS—*continued.*

CLASS 4.—ORPINGTONS, ANY COLOUR, WET MASH—*continued.*

Pen No.	Competitor.	Breed.	Total to 31st March, 1922.	Pen No.	Competitor.	Breed.	Total to 31st March, 1922.
50	R. R. Christie ..	Black Orpingtons	220	34	M. Whitley ..	Black Orpingtons	179
75	Marville Poultry Farm	,,	213	69	F. G. Fereday ..	,,	178
64	G. B. Brown and Son	,,	213	47	Wanchai Poultry Farm	,,	176
70	F. G. Fereday ..	,,	212	48	Wanchai Poultry Farm	,,	174
45	M. Marten ..	,,	210	43	R. C. Brett ..	,,	174
46	M. Marten ..	,,	208	33	M. Whitley ..	,,	171
38	Woorayl Poultry Farm	,,	208	51	J. C. Mickelburough	,,	171
68	H. C. Clark ..	,,	207	25	C. C. Dunn ..	,,	161
29	John Christie ..	,,	205	77	Deepspring Poultry Farm	,,	160
27	F. W. Gough ..	,,	203	49	R. R. Christie	,,	156
28	F. W. Gough ..	,,	201	56	L. W. Parker ..	,,	155
21	Chanticleer Poultry Yards	,,	200	36	Maypole Poultry Farm	,,	154
74	A. Siede and Sons	,,	195	67	H. C. Clark ..	,,	151
55	L. W. Parker ..	,,	193	78	Deepspring Poultry Farm	,,	124
52	J. C. Mickelburough	,,	193	72	C. E. Graham ..	,, (*d*)	103
20	Merval Poultry Farm	,,	190	19	Merval Poultry Farm	,,	79
30	John Christie ..	,,	184				
60	J. B. Nicoll ..	,,	183				

Class 5.—All Heavy Breeds other than Orpingtons, Wet Mash.

Pen No.	Competitor.	Breed.	Total to 31st March, 1922.	Pen No.	Competitor.	Breed.	Total to 31st March, 1922.
16	Jas. Ryan ..	R.I.R.	300	7	A. Minter ..	Faverolles	203
15	Jas. Ryan ..	,,	247	17	Clee Hill Stud Poultry Farm	Langshan	196
6	Kreira Poultry Farm	R.I.W.	240	8	A. Minter ..	Faverolles	188
14	McCormack and Kinzel	R.I.R.	235	10	Champion Poultry Farm	R.I.R.	176
11	L. Faulkner ..	,,	234	12	L. Faulkner ..	,,	166
2	M. Whitley ..	,,	222	4	Chas. Ridley ..	Langshan	165
13	McCormack and Kinzel	,,	211	1	M. Whitley ..	R.I.R.	155
3	Chas. Ridley ..	Langshan	208	9	Champion Poultry Farm	,,	138
5	Kreira Poultry Farm	R.I.W.	208	18	Clee Hill Stud Poultry Farm	Langshan	58

NOTE.—Death of birds marked thus (*d*).

WEIGHT OF EGGS.

Pen No.	Name.	Number of Eggs.	Weight of Eggs.	Average Weight of Egg.	Average Weight per Dozen.
			oz.	oz.	oz.
	Class 1.—Light Breeds, Wet Mash.				
31	F. Gaskell	1,060	2,135.5	2.014	24.170
32	A. Scott	1,298	2,606.5	2.008	24.097
33	U.O.I. Poultry Farm	1,149	2,286	1.989	23.870
34	J. G. Alston	1,192	2,326	1.951	23.416
35	A. McCall	1,051	2,086.5	1.985	23.823
36	T. A. Pettigrove	1,217	2,406	1.977	23.724
37	G. Pocknall	1,258	2,484	1.974	23.694
38	Herbert Bros.	1,153	2,385	2.068	24.822
39	P. N. Tilley	1,079	2,158.5	2.000	24.005
40	R. Moore	914	1,797.5	1.967	23.599
41	G. B. Brown and Son	706	1,413	2.001	24.017
42	Deep Spring Poultry Farm	1,186	2,343.5	1.976	23.711
43	Harry Miller	1,103	2,172.5	1.970	23.635
44	C. C. Langley	1,394	2,756	1.977	23.724
45	Norman Meyers	1,208	2,357	1.951	23.414
46	J. H. Chirnside	1,149	2,264	1.970	23.645
47	Clee Hill Stud Poultry Farm	1,087	2,153.5	1.981	23.774
48	E. A. Lawson	1,237	2,510.5	2.029	24.354
49	J. P. Brown	1,270	2,604	2.050	24.605
50	(Vacant)				
51	Miss M. T. Kidd	1,098	2,198.5	2.002	24.027
52	D. Gibson	1,154	2,272	1.969	23.626
	Class 2.—Light Breeds, Dry Mash.				
53	B. Brown	1,186	2,334.5	1.968	23.620
54	Chas. Ridley	1,231	2,431	1.975	23.698
55	(Vacant)				
56	Deep Spring Poultry Farm	1,313	2,521	1.920	23.040
57	(Vacant)				
58	F. Gaskell	1,146	2,313	2.018	24.220
59	A. Enticknap	1,541	3,054.5	1.982	23.786
60	Herbert Bros.	1,262	2,610	2.068	24.818
61	A. McCall	1,141	2,316	2.030	24.357
62	Norman Meyers	1,552	3,148.5	2.029	24.344
63	G. McDonnell	1,327	2,816.5	2.122	25.469
64	(Vacant)				
	Class 3.—Heavy Breeds, Wet Mash.				
65	Clee Hill Stud Poultry Farm	1,190	2,444	2.054	24.645
66	R. R. Christie	1,090	2,156	1.978	23.736
67	J. Wear (2 birds disqualified)				
68	Arthur H. Mould (1 bird disqualified)				
69	(Vacant)				
70	C. B. Bertelsmeier	1,308	2,538.5	1.941	23.289
71	Louis Currie	1,189	2,336.5	1.965	23.581
72	(Vacant) ..				
73	Frank Harrison	1,429	2,909·5	2.036	24.432
74	C. E. Graham	1,201	2,501	2.082	24.989
75	D. W. Ilton	1,376	2,771·5	2.014	24.170

WEIGHT OF EGGS—*continued.*

Pen No.	Name.	Number of Eggs.	Weight of Eggs.	Average Weight of Egg.	Average Weight per Dozen.
			oz.	oz.	oz.
	CLASS 3.—HEAVY BREEDS, WET MASH—*continued.*				
76	J. C. Mickelburough (3 birds disqualified)				
77	Herbert Bros.	1,275	2,504·5	1·964	23·572
78	L. W. Parker	1,062	2,160.5	2·034	24·412
79	S. Andrew	1,358	2,706.5	1·993	23·916
80	J. Quinlan	1,325	2,629	1·984	23·810
81	W. A. Shevill	1,475	2,923.5	1·982	23·784
82	Deep Spring Poultry Farm (1 bird disqualified)				
83	Marville Poultry Farm (2 birds disqualified)				
84	Mrs. N. Pearson (2 birds disqualified)				
85	Wanchai Poultry Farm	1,312	2,611	1·990	23·881
86	Jas. A. Dunn (1 bird disqualified)				
	Class 4.—Heavy Breeds, Dry Mash.				
87	(Vacant)				
88	Jas. A. Dunn (2 birds disqualified)				
89	R. R. Christie	1,192	2,368	1·986	23·839
91	Clee Hill Stud Poultry Farm (1 bird disqualified)				
92	Marville Poultry Farm	1,344	2,670·5	1·987	23·844
93	(Vacant)				
94	J. C. Mickelburough (1 bird disqualified)				
95	W. A Shevill (6 birds disqualified)				

PRIZE LIST.

For the greatest total number of eggs laid by a pen in each Class of Sections "A" and "B":—

Section A.—Groups of Six Birds.

Class 1.—Light Breeds.—Wet Mash.

1st Prize, Champion Certificate .. C. C. Langley, cnr. Poath and Dalny roads, Murrumbeena (1,394 eggs).

2nd Prize, Government Certificate .. A. Scott, 17 Tongue-street, Yarraville (1,298 eggs).

3rd Prize, Government Certificate .. J. P. Brown, 531 Doveton-street, North Ballarat (1,270 eggs).

Class 2.—Light Breeds.—Dry Mash.

1st Prize, Champion Certificate .. Norman Meyers, "Stapley," Queen's-avenue, Glen Huntly (1,552 eggs).
2nd Prize, Government Certificate .. A. Enticknap, 216 High-street, Prahran (1,541 eggs).
3rd Prize, Government Certificate .. G. McDonnell, 150 Camberwell-road, Auburn (1,327 eggs).

Class 3.—Heavy Breeds.—Wet Mash.

1st Prize, Champion Certificate .. W. A. Shevill, Reserve-road, Beaumaris (1,475 eggs).
2nd Prize, Government Certificate .. Frank Harrison, Eallbundry-avenue, Frankston (1,429 eggs).
3rd Prize, Government Certificate .. D. W. Ilton, Narracan Poultry Farm, Herald-street, Cheltenham (1,376 eggs).

Class 4.—Heavy Breeds.—Dry Mash.

1st Prize, Champion Certificate .. Marville Poultry Farm (A. H. Dumaresq), South-road, Moorabbin (1,344 eggs).
2nd Prize, Government Certificate .. J. G. Mickelburough (All Varieties Poultry Farm), Herald-street, Cheltenham (1,196 eggs)
3rd Prize, Government Certificate .. R. R. Christie, Stelmo Poultry Farm, Bentleigh (1,192 eggs).

Section B,—Individual Birds.

Class 1.—Leghorns.—Wet Mash.

1st Prize, Champion Certificate .. Herbert Bros., Diamond Creek (293 eggs).
2nd Prize, Government Certificate .. Herbert Bros., Diamond Creek (282 eggs).
3rd Prize, Government Certificate .. F. Crafts, 74 Cassell's-road, North Brunswick (281 eggs).

Class 2.—Leghorns.—Dry Mash.

1st Prize, Champion Certificate .. Norman Meyers, "Stapley," Queen's-avenue, Glen Huntly (290 eggs).
2nd Prize, Government Certificate .. Norman Meyers, "Stapley," Queen's-avenue, Glen Huntly (285 eggs).
ditto (equal second) .. .. G. McDonnell, 150 Camberwell-road, Auburn (285 eggs).

Class 3.

No Competition.

Class 4.—Orpingtons, any colour.—Wet Mash.

1st Prize, Champion Certificate .. A. G. Stevens, Mooroopna (284 eggs).
2nd Prize, Government Certificate .. A. G. Stevens, Mooroopna (280 eggs).
3rd Prize, Government Certificate .. Maypole Poultry Farm (E. P. Brown), Pearcedale-road P.O., *viâ* Somerville (269 eggs).

Class 5.—All Heavy Breeds other than Orpingtons.—Wet Mash.

1st Prize, Champion Certificate .. Jas. Ryan, 33 Davis-street, Coburg (300 eggs).
2nd Prize, Government Certificate .. Jas. Ryan, 33 Davis-street, Coburg (247 eggs).
3rd Prize, Government Certificate .. Kreira Poultry Farm (C. Burden), 25 Goe-street, Caulfield (240 eggs).

For the greatest total number of eggs laid by individual birds in each Class of Section "A."

Class 1.—Light Breeds—Wet Mash.

1st Prize, Champion Certificate	.. Harry Miller, 64 Childers-street, East Kew (254 eggs).
2nd Prize, Government Certificate	.. A. Scott, 17 Tongue-street, Yarraville (251 eggs)
3rd Prize, Government Certificate	.. A. Scott, 17 Tongue-street, Yarraville (250 eggs).

Class 2.—Light Breeds.—Dry Mash.

1st Prize, Champion Certificate	.. F. Gaskell, 17 Kelvin-grove, Armadale. (295 eggs).
2nd Prize, Government Certificate	.. A. Enticknap, 216 High-street, Prahran (287 eggs).
3rd Prize, Government Certificate	.. Norman Meyers, "Stapley," Queen's-avenue, Glen Huntly (282 eggs).

Class 3.—Heavy Breeds.—Wet Mash.

1st Prize, Champion Certificate	.. Herbert Bros., Diamond Creek (299 eggs).
2nd Prize, Government Certificate	.. J. Quinlan, 13 Westbourne-road, Kensington (296 eggs).
3rd Prize, Government Certificate	.. W. A. Shevill, Reserve-road, Beaumaris (286 eggs).

Class 4.—Heavy Breeds.—Dry Mash.

1st Prize, Champion Certificate	.. J. C. Mickelburough, Herald-street, Cheltenham (279 eggs).
2nd Prize, Government Certificate	.. Jas. A. Dunn, Meeniyan (258 eggs).
3rd Prize, Government Certificate	.. Marville Poultry Farm (A. H. Dumaresq), South-road, Murrumbeena (2 birds each) (252 eggs).
ditto (equal third) ..	.. J. C. Mickelburough, Herald-street, Cheltenham (252 eggs).

For the pen which shows the greatest average weight per dozen eggs laid:—

Section A.—Groups of Six Birds.

1st Prize, Government Certificate	.. G. McDonnell, 150 Camberwell-road, Auburn, 25.469 ozs. per dozen.

For the pen the eggs of which realized the highest market value throughout the competition:—

Section A.—Groups of Six Birds.

1st Prize, Government Certificate	.. A. Enticknap, 216 High-street, Prahran (pen 59). 1,541 eggs; value, £11 13s. 1d.

WEEDS AND THEIR ERADICATION.

(Continued from page 294.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

Stinkwort, *Inula graveolens,* Compositæ.

This most troublesome weed is proclaimed under the Victorian Thistle Act for the whole of the State.

It is a native of the Mediterranean regions, and was introduced into South Australia over 50 years ago for use, so it has been stated, in the smoking of bacon and hams.

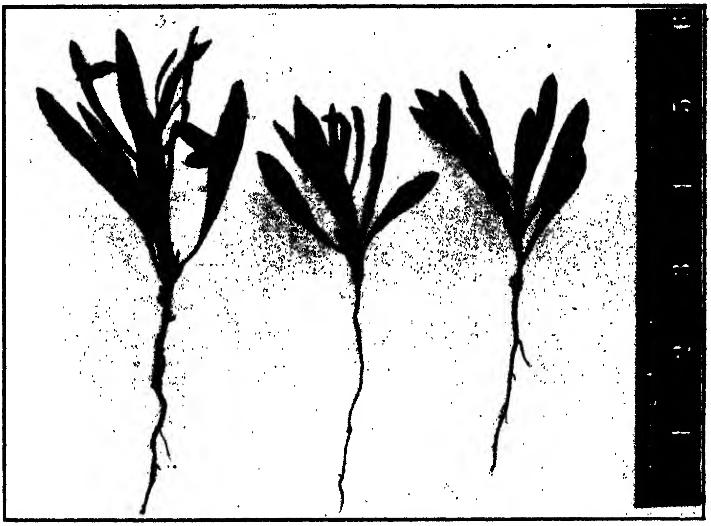


Fig. 40.—Young Plants of Stinkwort. (Pulled towards end of December.)

It is often confused with St. John's wort, although there is no resemblance between the two plants; further, the latter flowers in the spring months, whereas stinkwort does not come into bloom until late in the autumn.

Stinkwort is an erect, strong-growing, sticky and much-branched annual plant, with a most pronounced smell. It bears numerous small pale-yellow flowers, which later produce an enormous number of wind-borne seeds.

Small specimens of the plant usually make their appearance during October, and continue growing until late in the season, coming into flower towards the end of March.

In spite of the serious menace of this weed, there are still some people who speak in its favour, claiming that it carries stock over drought periods. As a matter of fact, animals will not eat this plant

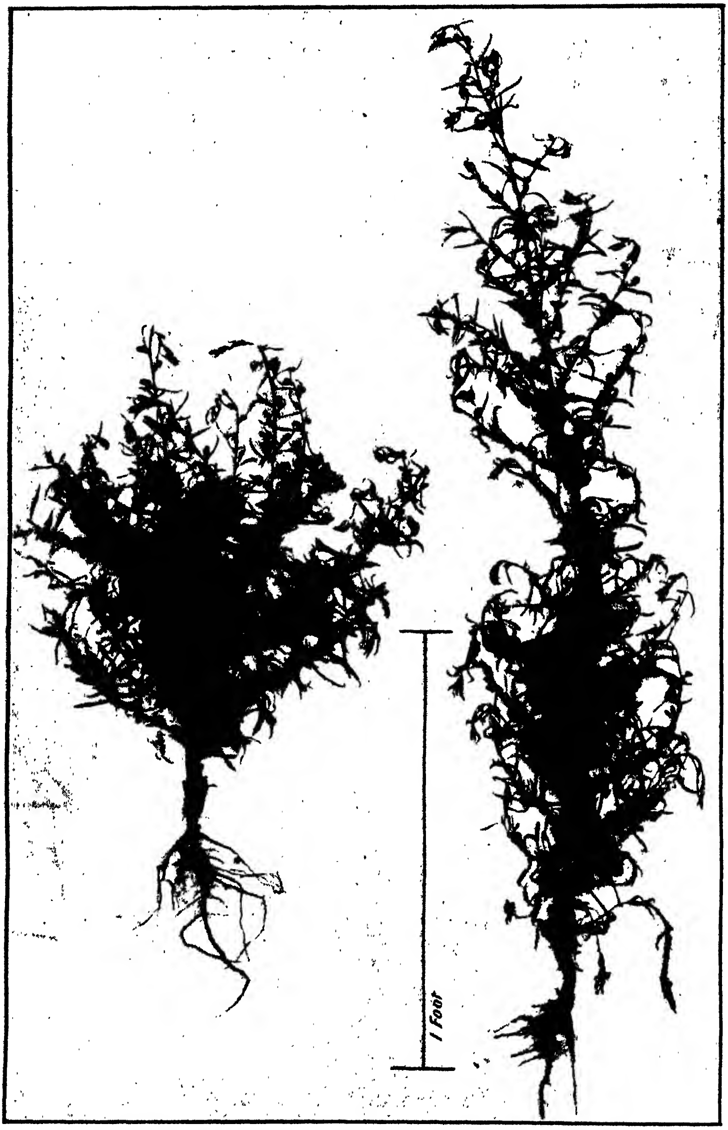


Fig. 41.—Stinkwort not yet in bloom, but buds forming. (Pulled 15th March.)

Fig. 42.—Stinkwort in flower. (Pulled 10th April.)

freely when it is of any size, and, if forced by hunger to do so, serious results to their health often follow, while at the very least it badly taints the milk of dairy cows.

Land-owners should do their level best to keep stinkwort in check, but, unfortunately, small patches are often neglected. This is especially the case when it first puts in an appearance in a new locality, whereas that should be the time to make special efforts to eradicate it, as, once it becomes thoroughly established in a district, its total eradication becomes impossible.

No opportunity must be missed for destroying this pestilent weed. The plants should be hand-pulled or hoed out wherever they may be found growing. This work should always be carried out before the plants commence to form flower-buds, as they have such abundant vitality that, if pulled when in the flowering stage and thrown on the ground, there is usually a percentage of flowers sufficiently forward to enable them to mature viable seeds. Therefore, any plants showing signs of flower buds should, after being pulled, be immediately burnt.

The seeds are blown so very freely by the wind that hand-pulling plants containing ripe seeds may tend to the further dispersal of the weed.

Hand-pulling stinkwort is often the cause of a most distressing skin trouble, and it would be well for those engaging in the work to protect themselves from actual contact with the plants, especially during very hot weather.

The weed appears to be fairly easily dealt with by fallowing, but this, to be successful, requires special attention during January and February.

Stinkwort delights in cultivated land, although it will thrive exceedingly well on hill country. It, however, does not appear to like hard impacted soils, being always more vigorous on those of a loose character.

Sheep will eat young stinkwort, and if infested country were heavily stocked while the plants were small (Fig. 40), much good would result. To compel sheep to eat the well-grown plants, besides being a risk, as stinkwort in flower appears to be injurious, gives no certainty that the weed will be eradicated; plants that have been eaten down by sheep often produce flowers so short in the stalk that they appear to be on the stems of the plant; many of these flowers will escape, and later on develop seeds.

Owing to the viscid stickiness of stinkwort, it arrests the seeds of many other plants, and especially those of thistles, so that if the former plants are hoed out and burnt, many seeds of other weeds are destroyed in the one operation. If, on the other hand, the destruction of this plant is neglected, many arrested seeds of weeds become established in addition to the stinkwort.

Apart from the wind, the seeds of this plant are easily spread by means of stock, rabbits, hares, and water.

Fortunately the seed does not appear to retain its viability for many years, though if plants have been allowed to mature seed, seedlings will continue to make their appearance for three or four years afterwards.

It would be a great help towards the suppression of stinkwort if public attention were directed at the beginning of each year to the bad character

of this weed, and, by means of this publicity, starting a really vigorous campaign for its suppression at that time, and before it had reached the flowering stage (Fig. 41). Land-owners would thus become familiar with its appearance, and those already acquainted with it would be reminded of the necessity of destroying it. In addition, the man who was indifferent to his own or his district's welfare would be compelled by the force of public opinion to make some attempt to clear his land of the pest.

Stinkwort grows vigorously during the hot months, making a strong much-branched plant often 4 feet in height. Fig. 42 represents a small specimen of this plant in bloom.

(To be continued.)

SOLDIER-SETTLERS' FARM COMPETITION, LEONGATHA.

Report of the Judge, J. S. McFadzean, Senior Dairy Supervisor.

The inspection of soldier-settler farms entered for the Leongatha Agricultural Society's prize was made on 31st January to 2nd February. There were fifteen competitors, all of whom had been working their properties for dairying for less than two years, consequently there were many sections of the work which were not far advanced. A scale of points had been fixed by the society, on which the competition was judged; and considering the embryo stage in which most of the farms were, the scoring was very satisfactory.

Forty points, or one-tenth of the whole, were set down for systematic crop rotation, but the time in occupation did not permit of such work having been yet carried out. Several of the competitors had plans laid for this section, but in most instances only a second crop had been taken by them from any of the cultivation.

Forty points were also obtainable for character and condition of crops for dairying purposes. Onions were one of the main crops grown, but these could not be given consideration as part of dairy-farm work, as they do not come in for stock feed; and potatoes, carrots, turnips, or mangels, would each serve the same purpose in crop rotation. Oats, barley, peas, millets, sorghums, soudan grass, rape, pumpkins, as well as the other crops mentioned, were all met with here; some of the farmers growing six varieties or more, while others confined their work to two. Although there may be time wasted in cutting up the sowings with too great a variety, there is good sense in trying out small sowings of crops which are not generally grown, but which are likely to do well in the district. Oats and tares, maize, mangels, and pumpkins should, however, form the basis of the fodder cropping in this locality every year, as these all do well there if the land is properly cultivated.

Several maize crops were seen which had been put in broadcast, instead of being in drills at least 3 feet apart to allow of intercultivation. Two or three workings of the soil between the rows while the plants are growing is as much a necessity with maize as with mangels,

potatoes, cabbages, or any other summer growing crop; and the yield per acre of maize can easily be doubled thereby. The land will also be kept free of weeds, and in good order for the following crop if that system is followed, while the quantity of seed required will also be much less when sown in drills.

On several of the farms attention had already been given to the care of grass land by top-dressings of lime, superphosphate, or bonedust, and both pastures and stock were looking well in consequence. Others were doing nothing in this way, while in some instances the land was literally overrun with rabbits, and the cattle were depending largely on such hand feeding with maize or other fodder as the owners were able to give them. On one farm, 120 rabbits had been poisoned on the morning the inspection was made. Most of the settlers here are pushing on with the work of netting their boundary fencing, and when that is done each will be able to clear off what rabbits are within the enclosed area, but on an unprotected block the cows have little chance for grass against the rabbits. One instance of the value of netting was mentioned where 1,500 rabbits had been poisoned on a block of 120 acres in one night prior to it being netted, but when the netting was completed 100 was the most obtained with one poisoning. Grass is the cheapest crop that the dairy farmer can grow, but 100 rabbits will overstock any ordinary farm.

The allotment of points for live stock was placed at 50 for dairy cattle, 15 for pigs, 15 for horses, 3 for poultry, and 7 for other stock. There are four Jerseys, three Ayrshires, and five cross-bred bulls in use in the herds. The seven pure-bred bulls were of a good class, and there were some pure-bred cows and heifers of both these dairy breeds, the majority of the rest of the cows being of a Jersey-Ayrshire cross. A few of the herds were of a very mixed lot of stock, and their returns were comparatively low; while some farmers had a very even lot of cattle, showing that much judgment had been exercised in the purchase, and these were being mated with pure bulls of the same breed. It is a pity that those using cross-bred bulls had not been better advised. In one or two instances pure-bred bulls were being hired, and it would be much better if more of this were done, so as to avoid breeding unsuitable stock by using the cross-bred males.

On the whole, the horses were a good serviceable lot, and very few surplus stock of this class were being kept. Pigs, also, were of fair quality, there being several pure Berkshires and Yorkshires, besides several first crosses of these with Tamworths. Poultry, too, were kept on most farms, and usually of a fair class. The seven points allowed for "other live stock" occasioned some inquiry by the settlers as to what was expected in that way, only two having solved the problem through keeping a few killing sheep. With machinery and other equipment the majority of the farms were fairly well furnished, some having a very complete outfit. Also, in regard to suitability and arrangement of farm buildings, most of the competitors had done well, and the housing of the various stock was being kept in a reasonably clean condition in the majority of instances.

In water supply there was much variety in creeks, wells, dams, and springs; but with the last-named supply some of the owners had allowed the head water to be puddled up by the stock, instead of keeping this clear and clean by fencing it in.

In fodder reserve some had only a small haystack. A few had a crop of mangels, beet, or carrots well advanced, and in two instances pea straw was being cared for, this being a good fodder which too frequently is wasted by being used for stock bedding. There were several good maize crops; but, so far, no preparation was being made to conserve any surplus for winter feeding as silage.

A fair subdivision of the farms had been effected in most cases, but there were a few places on which the dairy herd had unrestricted access to the whole of the grazing land, and the best was thus not being got out of it. Vegetables and a few fruit trees were being grown on all the farms, but the attention given to this section varied much. A good vegetable garden is a big factor in the provisioning of the farm household, and any surplus can well be used up by poultry, pigs, or cows; the meat supply of the house thus also being assisted by the garden.

As the farms were nearly all new places, natural shelter in trees and scrub was all that was available, in most instances, for the stock, but trees of various kinds had already been planted by some of the competitors. While the dwellings were in most cases fully adequate for present requirements, there was wide variation in what was termed "surroundings." With the newer houses there had been no time for trees or hedges to make much growth, but the planting of these had been given care. A few were fortunate in having obtained homestead blocks where trees were well established, and this added to the comfort of those in occupation.

The wide variation in the quality of the dairy stock showed up very prominently in the herd returns, the better grade stock having much the advantage. As several of the competitors had not been long enough established to enable a comparison to be made on a full year's work, this was done on the returns for seven months, from July to January inclusive, the points being allotted on the basis of butter-fat per cow.

In general management there was also much variation. Use of subdivision, clean stock quarters, rabbit extermination, care of premises generally—including cream storage, water supply, and machinery shed—all come under this heading, and all lost points in some part of this section. Cream should be always kept in a cool place and protected from flies. A water supply from a dirty spring may cause ropy milk. A dirty skim-milk vat or neglected poultry house or pigsty will not improve the atmosphere surrounding the dairy premises, while the fly pest is always largely increased under such insanitary conditions. There is no occasion for stench centres such as these to exist on any farm. In only a few instances were the farm yards untidy, and in some cases neatness was an outstanding feature of the whole place, much handy management being shown in this direction.

On the whole, this competition fully justified the work given to it by the Leongatha society. The farms to be judged were arranged in groups, and the owners notified as to when to expect the event to take place, stewards being appointed for each group, so that no time would be lost in getting through.

A full list of the points allotted in each case is supplied, and from this each competitor will be able to see how his work compared with the others, and where more headway can best be made for future contests.

Points Gained in Competition.

	Best Method of Crop Rotation.	Character, Condition and Value of Crops for Dairying Purposes.	Condition of Grass Land.	Suitability of Live Stock—Quality and Condition. Cattle.	Pigs.	Horses.	Other Live Stock.	Poultry.	Machinery and Equipment.	Suitability and Arrangement of Farm Buildings.	Water Supply.	Fodder Reserves.	Subdivision—Fencing, Gates, &c.	Trees for Shelter.	Orchard and Vegetable Garden.	Home—General Care of Buildings with Surroundings.	Factory Returns—Herd Average.	General Management.	Total.
Possible Points ..	**40**	**40**	**20**	**50**	**15**	**15**	**7**	**3**	**20**	**25**	**10**	**20**	**10**	**5**	**10**	**20**	**50**	**40**	**400**
1. Vagg, E. J. ..	20	16	13	40	13	13	..	2	12	20	9	8	7	3	7	18	39	22	262
2. Amos, V. ..	20	28	11	37	..	14	..	2	18	20	7	5	7	2	6	18	40	24	259
3. Calder, D. C. ..	20	24	14	30	9	13	7	2	8	22	7	13	7	2	5	18	19	26	356
4. Millett, C. H. W.	20	20	14	30	12	13	..	2	18	20	7	10	6	1	8	18	30	26	255
5. Edwards, G. H.	20	30	16	30	13	14	..	..	16	12	8	10	8	2	7	18	21	20	245
6. Blamford, C. ..	26	34	14	17	7	12	..	1	16	15	7	12	7	2	6	18	24	24	242
7. Hodson, A. G.	20	28	12	17	7	12	..	2	17	17	7	10	7	2	9	19	27	20	233
8. Potts, A. C. ..	20	30	15	22	7	13	..	..	15	16	8	10	8	2	6	18	16	20	230
9. Peacock, W. R.	20	12	11	25	5	14	..	2	12	21	8	8	7	2	4	18	34	24	227
10. Bright, G. H. ..	20	26	10	20	12	12	..	1	15	15	6	10	7	4	8	18	21	20	225
11. Beard, H. ..	20	28	6	22	9	13	2	2	16	21	9	11	5	2	5	18	19	16	224
12. Bright, H. J. ..	20	16	12	25	12	12	..	..	14	15	6	8	7	4	7	18	27	20	223
13. Rodwell, R. J.	20	30	6	20	7	7	..	2	14	16	7	10	5	2	6	18	15	20	205
14. Mathies, H. ..	20	24	15	25	12	13	..	2	12	8	7	10	6	2	8	12	16	12	204
15. Maddern, P. ..	20	20	6	15	7	13	..	2	16	17	7	4	5	1	5	14	14	20	186

STANDARD HERD TEST.

REPORT FOR QUARTER ENDED 31st MARCH, 1922.

The cows which have qualified for certificates number 172, out of a total of 192 which completed the term. Individual returns are as follow:—

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
Mrs. M. I. Alston Estate, Cobram	2	2	Jersey ..	Welcome of Tarnpirr	7069	31.3.21	273	19	6,091	6·75	410·93	200	468½
				Pidgeon of Kameruka	6035	11.4.21	273	20	7,028	5·83	409·46	250	466¾
C. Bamford, Benalla	4	4	Ayrshire ..	Spot of Medburn Grove	Not yet allotted	28.3.21	273	14½	5,778	4·58	264·58	175	301¾
				Babe of Medburn Grove	"	11.4.21	273	17	9,118	3·99	363·34	250	414¼
				Lupin of Medburn Grove	4859	19.4.21	273	18½	7,047	4·00	282·39	200	322
				Mermaid of Shannon Grove	Not yet allotted	4.5.21	273	14	6,143	4·55	279·29	250	318½
A. E. Batson, Buckley, near Geelong	1	1	Jersey ..	Lady Grey 6th of St. Albans	6367	11.6.21	271	4	4,634	5·56	257·80	250	294
Mrs. I. Beard, Outtrim	3	3	Jersey ..	Banksia of Springhurst	5387	2.4.21	273	22	6,421	6·13	393·38	250	448½
				Camellia of Springhurst	6200	9.4.21	273	22	6,893	6·09	414·84	250	473
				Columbine of Springhurst	5392	11.6.21	273	13½	4,929	5·66	279·18	250	318¼
Mrs. Agnes Black, Noorat	4	3	Jersey ..	Noorat Pearl	Not yet allotted	4.4.21	273	8½	5,547	5·02	278·49	175	317½
				Madge	3575	30.4.21	273	12½	6,632	4·79	317·66	250	362¼
				Noorat Beauty	6408	28.5.21	270	4	7,150	4·76	340·03	250	387¾
W. J. Colman, Kerang	3	3	Jersey ..	Queen of Bellaire	9261	8.1.21	273	17	6,859	5·26	360·57	200	411
				Pearl 5th of Melrose	5557	22.2.21	273	16	6,087	5·41	329·43	250	375½
				Captive	2965	1.5.21	273	25	8,021	4·45	357·28	250	407¼

Certificated Cows—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
Department of Agriculture, Werribee	19	15	Red Poll ..	Toronto	326B	25.1.21	273	14	4,230	4·93	209·76	200	239¼
				Sovereign	320B	16.3.21	273	18½	5,940	4·44	263·44	175	300¼
				Corona	382C	17.3.21	273	18	5,463	4·34	237·21	175	270½
				Pico	250A	18.3.21	273	10½	6,844	4·07	278·75	175	317¾
				La Marseillaise..	394C	21.3.21	273	9	5,747	4·37	251·28	175	286½
				Sumontina	321B	22.3.21	273	11½	6,285	4·19	263·34	175	300¼
				Banksia	376C	23.3.21	273	13	5,308	4·54	241·02	175	274¾
				War Wings	259A	24.3.21	273	18	6,828	4·23	288·76	175	329¼
				Tundra	255A	1.4.21	273	9	4,394	4·61	203·90	175	232½
				Nyasa	249A	3.4.21	217*	11	3,834	4·90	187·85	175	214¼
				Cutty Sark	383C	8.4.21	273	24½	8,473	4·40	373·12	175	425½
				Flandrina	386C	20.4.21	273	17	5,911	4·14	244·77	200	279
				Brabantia	378C	27.4.21	273	18½	6,429	4·59	294·78	175	336
				Laodicea	306B	29.4.21	273	15	5,433	4·51	244·85	200	279
				Morocco	308B	2.5.21	273	34½	11,920	3·50	417·43	250	476
Department of Agriculture, Werribee	3	3	Friesian ..	Dominion Coringa	380	19.2.21	273	38½	13,923	3·58	498·90	250	568¾
				Victoria Dutch Maid	Not yet allotted	24.4.21	273	28	6,054	4·01	242·49	175	276½
				Dominion Woodnymph	,,	14.6.21	273	36½	9,834	2·81	284·52	250	324¼
Department of Agriculture, Burnley	2	2	Friesian ..	Dominion Hyacinth	374	16.2.21	273	..	11,287	3·97	447·82	250	510½
				Victoria Corunna	Not yet allotted	8.6.21	273	22½	7,635	3·55	271·08	175	309
	1	1	Jersey ..	Collingwood's Beauty	6749	29.1.21	273	20½	4,310	5·97	257·31	250	293¼
C. Deverell, Wangaratta	4	4	Jersey ..	Coleus of Springhurst	7325	31.3.21	273	14½	5,774	6·97	402·26	200	458½
				Brighton Princess of Springhurst ..	5391	10.4.21	273	12½	9,208	5·52	508·73	250	580
				Dolichos of Springhurst	6203	20.5.21	273	13½	5,895	5·02	296·07	250	337½
				Myrtle of Springhurst	7331	21.5.21	272‡	14	5,801	6·01	348·84	200	397¾
C. Falkenberg, Elliminyt	2	2	Jersey ..	Trixie of Colac	4914	18.4.21	251†	14½	5.859	5·63	330·06	250	376¼
				Pansy of Colac..	4911	21.5.21	273	14½	7,714	4·67	360·24	250	410¾

* Withdrawn through udder ailment. † Withdrawn before completion ‡ Sold before completion.

CERTIFICATED COWS—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
R. Faragher, Koroit	2	2	Jersey ..	Belle A.	6315	21.3.21	273	13½	5,890	5·18	304·98	175	347¾
				Clover of Saranac	9313	28.3.21	273	13¼	5,867	5·58	327·22	175	373
Finn Brothers, Port Fairy	3	3	Jersey ..	Science of Springhurst	6207	3.5.21	273	11	4,812	5·95	286·22	250	326¼
				Trixie of Tarnpirr	5173	5.6.21	273	14	7,771	6·17	479·62	250	546¾
				Seaweed of Springhurst	6208	10.6.21	273	13½	7,074	5·28	374·61	250	427
Flack and Sewell, Berwick	4	4	Friesian ..	Bainfield No. 40	Not yet allotted	6.4.21	273	28½	8,548	3·56	304·44	200	347
				Miss Muller 3rd of Berry	242	11.4.21	273	19	7,478	3·72	278·17	175	317
				Miss Muller 2nd of Berry	224	15.4.21	273	33½	11,439	3.63	415·03	250	473¼
				Leonora Canary	Not yet allotted	8.5.21	273	14	8,076	4·07	329·05	200	375¼
Mrs. M. and W. A. Francis, Kilcunda	1	1	Ayrshire ..	Duchess of Hillcrest	5139	17.2.21	273	17	4,759	4·83	230·08	175	262¼
G. Gange, Mininera	2	2	Ayrshire ..	Alvie of Roseleigh	7296	11.5.21	273	21	7,297	4·53	330·71	175	377
				Gardenia of Seafield	5141	26.5.21	235	4	6,632	4.35	288·51	250	329
N. Gange, Mininera	1	1	Ayrshire ..	Petunia of Gleucairn	4417	7.4.21	273	22½	7,521	4·23	317·93	250	362½
Geelong Harbor Trust, Marshall-town, near Geelong	9	9	Ayrshire ..	Floss of Sparrovale	3892	28.12.20	273	16	7,137	4·07	290·64	200	331¼
				Rose of Sparrovale	3906	31.12.20	273	25½	9,508	4·53	430·90	250	491¼
				Primrose of Sparrovale	6359	16.1.21	273	17½	6,421	4·70	302·08	200	344¼
				Belle of Sparrovale	3883	17.1.21	240	4	6,070	4·38	265·68	250	303
				Duchess of Sparrovale	3889	29.1.21	273	6	6,930	4·29	297·17	250	338¾
				Gladys of Sparrovale	6355	30.1.21	273	16½	5,883	4·73	278·13	175	317
				Myrtle of Sparrovale	3905	29.3.21	273	6	5,764	4·69	270·54	200	308½
				Mayflower of Sparrovale	6358	24.5.21	273	14½	5,731	4.50	257·76	175	294
				Gipsy Girl of Sparrovale	3894	29.5.21	273	12½	6,607	4·90	323·87	250	369¼

CERTIFICATED COWS—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
W. C. Greaves, Monomeith	1	1	Ayrshire ..	Fidget 2nd of Warrook	Not yet allotted	6.5.21	273	19	6,689	4·21	281·76	175	321¼
D. F. Griffiths, Inverleigh	1	1	Ayrshire ..	Anitra of Gowrie Park	5175	24.6.21	273	19	8,747	4.38	383·00	250	436½
R. Hall, Sale ..	1	1	Ayrshire ..	Venus of Dunachton	3956	13.5.21	273	13½	7,120	3·62	257·51	200	293½
T. Harvey, Boisdale	4	4	Jersey ..	Kirsty 8th of Jerseyholm	6846	1.4.21	273	13½	7,239	5·46	395·02	200	450½
				Kirsty 6th of Jerseyholm	4980	2.4.21	273	14	6,580	6·14	413·71	250	471½
				Kirsty 7th of Jerseyholm	5918	3.6.21	273	13	6,416	6·40	410·63	250	468¼
				Lady Marge of Jerseyholm	4981	16.6.21	273	20	7,263	5·93	430·42	250	490¾
W. Henderson, Grasmere	1	1	Ayrshire ..	Gertie of Warrook	3986	3.6.21	273	6	6,241	4·76	297·30	250	339
Dr. and Mrs. E. J. Henderson, Wangaratta	1	1	Jersey ..	Lantana of Springhurst	6204	18.5.21	273	7½	5,569	5·96	331·94	250	378½
J. Hutchinson, Somerville	1	1	Jersey ..	Valda's Belle of Somerville	9420	8.6.21	273	17½	5,404	5·74	310·40	175	354
A. Jackson, Glen Forbes	2	2	Jersey ..	Canary of Lysterfield	Not yet allotted	22.4.21	273	14½	5,180	5·29	274·06	250	312½
				Creamy of Lysterfield	6978	13.6.21	273	21	7,290	4·54	331·23	250	377½
S. A. Johnson, Woodend	3	3	Ayrshire ..	Jessamine of La Motte	5256	2.4.21	273	23½	8,120	4·12	334·35	200	381¼
				Brown Bess of La Motte	5254	6.4.21	273	20	7,529	4·57	343·83	200	392
				Molline of La Motte	5259	4.5.21	273	11	6.940	4·94	343·96	250	392

CERTIFICATED COWS—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
A. W. Jones, Whittington, near Geelong	6	6	Jersey ..	Fuchsia 13th of Melrose	6300	30.3.21	273	18	7,672	5·72	439·13	250	500½
				Mermaid 4th of Melrose	6307	10.4.21	273	6½	7,563	6·05	457·91	250	542½
				Lady Grey 1st of St. Albans	4186	2.5.21	273	10½	6,147	6·26	384·72	250	438½
				Lilac of Tarnpirr	6028	11.5.21	273	15	7.750	5·47	423·82	250	483¼
				Jubilee 15th	5056	21.5.21	273	18½	10,235	5·17	528·72	250	602¾
				Beautie of Tarnpirr	6023	18.6.21	273	6½	7,647	6·36	486·27	250	554¼
A. W. Jones, Whittington, near Geelong	4	3	Friesian ..	Nora's Pearl	363	9.5.21	273	12	9,730	3·64	354·35	250	404
				Bolobek Rose	319	11.5.21	273	15	10,132	3·73	378·05	250	431
				Brookland's Maid	449	28.5.21	273	11	8,897	3·94	350·84	250	400
Kerr Brothers, Bacchus March	3	3	Shorthorn ..	Morven Cressida	Not yet allotted	1.4.21	273	21	7,338	3·97	291·57	250	332½
				Morven Ruby	”	10.5.21	273	18½	6,802	3·83	250·65	250	285¾
				Morven Duchess 14th	”	7.6.21	273	12½	8,110	3·58	290·00	250	330½
J. A. Lang, Warrion	9	4	Ayrshire ..	Peggy 2nd of Riccarton	6513	14.4.21	273	9½	5,254	4·14	217·51	175	248
				Tabitha of Gleneira	3213	15.4.21	251	4	6,402	4·28	274·13	250	312½
				Doey of Riccarton	6497	19.5.21	271	4	6,074	3·83	232·68	200	265¼
				Emily 2nd of Riccarton	6499	19.5.21	273	7½	5,124	4·22	216·11	175	246½
Agricultural High School, Leongatha	2	2	Jersey ..	Alice	Not yet allotted	11.4.21	273	10½	6.286	6·11	383·95	250	437¾
				Surprise	”	12.4.21	273	16½	6,029	5·87	353·92	250	403½
Leslie and Gerrand, Sale	2	2	Ayrshire ..	Flossie 2nd	6522	7.4.21	273	16	7,873	3·90	306·32	250	349¼
				Hilda 2nd of Raith	6525	14.4.21	264*	12	7,514	3.79	285·09	200	325

* Withdrawn before completion.

Certificated Cows—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
R. Lidgett, Myrniong	4	3	Shorthorn ..	Ada	Not yet allotted	2.5.21	273	12	7,089	3·83	271·65	250	309¾
				Pentland's Bloom 2nd	"	28.5.21	263	4	5,978	4.61	275·53	250	314
				Beauty	"	7.6.21	253	4	6,419	4·15	266·12	250	303¼
C. G. Lyon and R. R. Kerr, Heidelberg	7	7	Jersey ..	Dido 3rd of Banyule	7118	16.3.21	273	15½	5,796	5·03	291·78	175	332¾
				Silvermine 14th of Banyule	5220	2.4.21	273	27½	8,661	4·34	375·69	250	428¼
				Statuette 3rd of Banyule	Not yet allotted	7.4.21	273	16	5,701	5·38	306·92	175	349¾
				Dainty Maid of Holmwood	7116	14.4.21	273	16½	6.603	5·59	346·79	250	395¼
				Chorus Girl of Banyule	7113	25.4.21	273	20½	6,759	5·35	361·28	175	411¾
				Hawthorn 5th of Banyule	5208	5.5.21	273	10½	5,806	5·03	291·99	250	333
				Hawthorn 7th of Banyule	6068	15.6.21	273	14½	7,996	5·43	434·29	250	495
R. H. Maher, Tongala	1	1	Jersey ..	Peeress of Wyuna	6752	23.4.21	185*	18	4,542	6·07	275·51	250	314
T. Mesley, Dalyston	2	2	Jersey ..	Pibroch	5256	28.5.21	273	25	8,988	5·22	469·07	250	534¾
				Charmian	5239	30.5.21	273	24	9,537	4·78	455·72	250	519½
D. C. Miller, Agnes	1	1	Jersey ..	Lotina's Twylish of Roseneath	6144	16.6.21	273	15½	5,759	5·05	290·87	250	331½
Mrs. L. Orchard, Grahamsvale	2	Nil	Jersey ..	.. ..	..	..	..	..	..	..	..	..	..
T. H. Payne, Kilmore	1	Nil	Red Poll ..	.. ..	..	..	..	..	..	..	..	..	..
E. Payne, Wangaratta	1	1	Ayrshire ..	Olive of Rosedale	6695	8.5.21	273	15	6,768	3·81	257·69	175	293¾

* Sold.

CERTIFICATED COWS—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs
H. Perdriau, Werribee	1	1	Ayrshire ..	Marcella of Inverleigh	Not yet allotted	14.5.21	272	4	5,026	4·11	206·33	175	235
R. Ralston, Moglonemby, near Euroa	3	3	Ayrshire ..	Dairymaid of Ben Kell	3048	13.5.21	273	27	9,403	4·43	416·13	250	474
				Pearl of Ben Kell	3052	24.5.21	273	10	7,975	4·08	325·56	250	371
				Poppy of Ben Kell	4584	30.5.21	273	15	6,148	4·65	286·09	250	326
J. D. Read, Springhurst	16	16	Jersey ..	Nightshade of Springhurst	3707	2.4.21	273	9½	9,087	5·00	454·51	250	518
				Empress of Springhurst	7328	2.4.21	273	16	7,166	5·28	378·36	200	431
				Begum of Springhurst	5388	6.4.21	273	4½	5,778	5·71	330·11	250	376
				Crocus of Springhurst	5398	9·4.21	273	11	8,225	5·28	434·55	250	495
				Freezia of Springhurst	4382	13.4.21	273	19	8,578	5·47	469·62	250	535
				Nemophila of Springhurst	7332	14.4.21	273	11½	5,362	5·76	309·06	200	352
				Jonquil of Springhurst	5398	7.4.21	273	17	6,949	5·99	416·25	250	474
				Cornflower of Springhurst	7326	19.4.21	273	13½	7,432	5·18	384·90	200	438
				Belladonna of Springhurst	5389	20.4.21	273	10½	8,148	4·90	399·08	250	455
				Dauphine of Springhurst	6202	29.4.21	273	12½	5,528	6·60	365·12	250	416
				Picotee of Springhurst	7333	2.5.21	271	4	6,488	5·08	329·32	200	375
				Trefoil of Springhurst	4395	14.5.21	273	15	8,062	5·66	456·48	250	520
				Virginia of Springhurst	7336	9.6.21	273	12½	6,310	6·23	393·41	200	448
				Clover of Springhurst	6201	15.6.21	273	7½	6,605	5·54	366·14	250	417
				Lucerne of Springhurst	5399	19.6 21	273	9	6.767	5·15	348·99	250	397
				Eidelweiss of Springhurst	7327	19.6.21	273	12½	6,773	5·82	394·50	200	449
Miss Bruce Reid, Bundoora	1	1	Jersey ..	Jublice Willoh	Not yet allotted	28.3.21	273	6	4,072	4·92	200·37	200	228
C. J. Reid, Devenish	1	1	Jersey ..	Fuchsia 12th of Melrose..	6299	3.3.21	273	18	8,046	4·93	396·64	250	452
J H. Rogers, Yarraville	3	3	Ayrshire ..	Future of Warrook	2244	1.4.21	273	15	7,679	4·16	319·78	250	364
				Pretty Polly of Glengowrie	2505	19.5.21	273	9	5,615	4·60	258·49	250	404
				Ladybird of Mapleton	4481	31.5.21	273	11	6,996	4·32	302·46	250	344

CERTIFICATED COWS—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
G. Rowe, Kardella	1	1	Jersey ..	Jessie of Welbourne	9687	23.6.21	273	19½	5,880	4·66	274·27	175	312¾
F. Sadler, Camperdown	1	1	Shorthorn ..	Moss Rose 8th	Not yet allotted	14.6.21	273	7½	4,848	4·51	218·51	175	249
Sadler Brothers, Noorat	7	6	Ayrshire ..	Leura of Burnbrae	5842	25.4.21	273	21½	7,018	4·64	325·57	175	371¼
				Clarice of Burnbrae	6839	6.5.21	273	9½	4,999	4·15	207·48	200	236½
				Lady Burnbrae	4612	2.5.21	272*	8	8,211	4·08	335·21	250	382¼
				Lady Louie of View Point	4614	23.5.21	273	19½	9,460	3·79	358·84	250	409
				Nicety of Yalart	6850	27.5.21	273	10½	7,566	4.29	324·30	250	369¾
				Lesbia of Yalart	3180	6.6.21	273	14½	8,412	4·15	348·86	250	397¾
Agricultural High School, Sale	2	2	Ayrshire ..	Madeira of Flinders	1740	14.4.21	273	15½	6,471	3·91	253·05	250	288½
				Young Madeira of La Trobe	4814	8.5.21	272*	13	6,586	3·93	259·11	250	295¼
Mrs. E. Sims, Toolern Vale	1	1	Jersey ..	My Hope of Kameruka	6032	3.6.21	273	14	6,732	5·83	392·48	250	447½
O. J. Syme, Macedon	5	5	Friesian ..	Bolobek Anabel	317	31.3.21	273	24	9,397	4·04	379·55	250	432¾
				Bolobek Bluebell	336	6.4.21	273	27½	8,284	3·31	273·83	175	312¼
				Bolobek Diana..	342	10.4.21	273	17½	6,515	3·55	231·01	175	263¼
				Bolobek Ida	334	18.4.21	273	20½	6,774	3·35	226·76	175	258½
				Bolobek Jean	320	23.5.21	273	16	11,621	3·61	419·23	250	478
J. H. Thorburn, Woodend North	2	2	Ayrshire ..	Oatlands Tip	6017	16.4.21	273	11	5,491	4·57	251·12	250	286¼
				Possum of La Motte	6018	12.6.21	266	4	6,235	4·42	275·38	250	314

* Withdrawn before completion.

CERTIFICATED COWS—*continued*.

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.
								lbs.	lbs.		lbs.	lbs.	lbs.
J. T. Tweddle, Sunbury	2	2	Friesian ..	Netherland Jessie Inka	Not yet allotted	7.6.21	273	23½	11,584	3·58	415·7	250	473¾
				Joans de Kol No. 2	„	21.6.21	273	23	8,113	2·81	228·16	175	260
G. Vallance, Bacchus Marsh	3	2	Ayrshire ..	Ettie of Banyule	5778	2.4.21	273	25	7,410	4·49	332·41	250	379
				Blanche of Ben Kell	3047	18.6.21	273	17	7,971	3·63	289·59	250	330¼
A. L. Walter, Little River	1	1	Jersey ..	Flower 14th of Melrose	Not yet allotted	24.4.21	255*	5	5,436	6·35	345·33	175	393¾
Agricultural High School, Warrnambool	4	1	Ayrshire ..	Scottish Lass of Glenbrae	5917	29.3.21	273	12	6,540	4·51	295·06	250	336¼
W. Woodmason, Murrumbeena	8	8	Jersey	Laura 10th of Melrose	Not yet allotted	7.4.21	273	18½	6,262	6·25	391·43	200	446¼
				Graceful Duchess 10th of Melrose ..	3646	10.4.21	273	15½	5,416	6·23	337·67	250	385
				Lady Elector 2nd of Melrose	5548	12.4.21	273	13½	5,989	6·02	360·80	250	411¼
				Handsome Girl 9th of Melrose	9882	15.4.21	273	15	5,094	6·41	326·36	175	372
				Jenny Lind 15th of Melrose	9884	30.4.21	273	15	5,697	5·52	314·28	175	358¼
				Daisy 12th of Melrose	9876	6.5.21	273	15½	5,556	5·49	305·11	175	348
				Daisy 7th of Melrose	5532	4.6.21	273	13	6,417	5·31	341·01	250	388¾
				Flower 6th of Melrose	3641	14.6.21	273	22½	8,122	5·17	420·08	250	479

* Withdrawn before completion.

STABLE AND CHAFF HOUSE.

Plans and Specifications.

On several occasions during the past few years judges of farm competitions have in their reports directed attention to outbuildings which made for efficiency. At times when printing the reports in this *Journal*, plans of some of these buildings were reproduced.

In the report on the Donald Crop and Fallow Competitions published last month, an illustration of a convenient type of stable was given. By the courtesy of Mr. W. R. Pope, we are now able to print specifications for the building of such a stable, and the plans shown have been prepared from drawings supplied by Mr. Pope.

DIMENSIONS, ETC., OF STABLE.

Floor—36 ft. x 59 ft.

Height—18 ft. 3 in. at centre.

Walls—9 feet high, and to consist of corrugated iron 7 feet, and battens 2 feet (battens half-an-inch apart to allow for ventilation).

Sparrow netting in No. 2 space to run full length of stable, and to be fastened by 3-in. x 1-in. hardwood.

DIMENSIONS OF CHAFF HOUSE (ATTACHED TO STABLE).

Floor—36 ft. x 15 ft. Timber, 6-in. x $\frac{7}{8}$-in.; joists, 3 in. x 2 in., and centres 22 in. Sleepers, 4 in. x 2 in., and centres

Height—15 feet.

Passage way—4 feet in width; to be left at one end and on both sides of stables.

MATERIAL FOR COMBINED BUILDING.

Blocks to be 36 inches apart and not less than 18 inches in the ground. Galvanized iron to be placed on top of all blocks.

Plates to be 4-in. x 2-in. hardwood, halved at all joints and angles, and checked $\frac{1}{2}$ in. to receive studs except to plates of main stable roof, which is to be 4 in. x 2 in. on edge, and over loose box 6 in. x 2 in., let 2 inches into top of 5-in. x 5-in. stall posts, and bolted with $\frac{1}{2}$-in. bolts.

Outside ground plate of chaff house to be 5 in. x 2 in., the wall iron to rest on the extra inch. (This will make house mouse-proof, and also prevent chaff from falling out.)

Studs of Chaff House to be 4-in. x 2-in. hardwood; corner studs to be 4 in. x 4 in., to be spaced not more than 32 inches and well nailed to plates. Walls to be 14 ft. 10 in. from block to top of plate.

Studs of Stable to be 4 in. x 2 in., not more than 32-in. centres; corners, 4 in. x 4 in.

Walls of skilllion to be 9 feet from block to top plate.

Rafters of skillion and chaff house to be 4-in. x 2-in. hardwood, with 32-in. centres.

Rafters of main roof of stable to be 3 in. x 2 in., and 32-in. centres.

Braces to be 3-in. x 1-in. hardwood let flush into studs and plates.

All corner posts to be 6 in. x 4 in.

All purlins to be 3 in. x 1½ in.

Stall posts to be 5 in. x 5 in. hardwood, dowelled into blocks with ⅞-in. iron pins, and scarfed to receive 4-in. x 2-in. top plate and 4-in. x 2-in. pitching piece to carry skillion rafters, and checked to receive stall rails spaced 5 feet in the clear.

Head posts to be 4-in. x 2-in. hardwood, spaced and to take stall rails and checked into 4-in. x 2-in. bottom plate and nailed to rafters.

Stall rails to be 7 ft. 6 in. over all from head posts to stall posts. Top rail 3 in. x 3 in., other two rails 3 in. x 2 in. Top rail to be 5 ft. 2 in. from block in front and 4 ft. 6 in. at back. Chin rail to be bolted to middle stall rail so that it may carry manger. Bottom rail to be 14 inches lower, and to go under manger. Separate each stall with 6-in. x 1-in. hardwood.

All stall rails to be checked into stall posts and head posts.

Chin rails to be 4 in. x 4 in., and bolted to middle stall rail and nailed to head posts to form frame for manger. Top of manger to be 3 ft. 3 in. from block level.

Wall battens and purlins to be 3-in. x 1½-in. hardwood—three to each length of iron, well nailed to rafters and studs.

In ridges and valleys, hardwood 6 in. x 1 in. to be used.

Sleepers of chaff house to be of 4-in. x 2-in. hardwool, 3-ft. centres, laid on blocks on edge (not edge level), with bottom plate to take floor joists.

Floor joists in chaff house and passage along one end and two sides of stable to be 3 in. x 2 in., 1-ft. 9-in. centres.

Floor of chaff house 6-in. x ⅞-in. T. and G. white pine.

Floor of stable passages to consist of 6-in. x 1-in. hardwood.

Floor of stable and loose box to be 4-in. x 2-in. hardwood, with top edge of each adzed to form a gutter 1 inch deep, so that horses' feet may easily grip. Floor to be laid on sleepers 5 in. x 3 in.

Loose box to be lined all round to a height of 7 feet with 6-in. x 1-in. hardwood, and end stall to be lined in same way.

Tie beams, 4 in. x 2 in., to be 7 feet apart in chaff house and 10 feet apart in stable. Brace each beam to ridge board with one 3-in. x 1-in. hardwood.

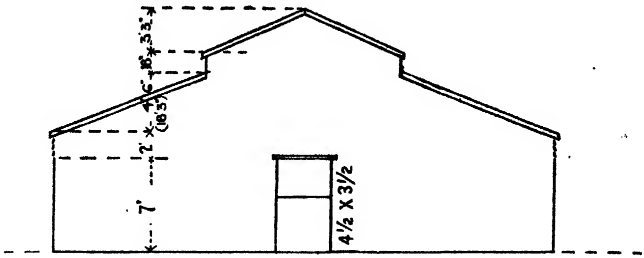
Roof of combined building to consist of 26-gauge Orb galvanized iron, 1½-in. side lap. Skillion roof to project inside stall posts about 5 inches.

Walls of chaff house to be covered with 26-gauge Orb galvanized iron. Skillion walls of stable to be covered to a height of 7 feet, 26-gauge Orb galvanized iron. Remainder of wall to consist of 3-in. x 1½-in. battens half-an-inch apart. Both skillion and main roof to consist of galvanized iron, like walls. Between skillion roof and top plate of main roof in a space of 18 inches ⅝-in. mesh wire netting to be nailed to 4-in. x 2-in. plate on top, and the 3-in. x 1-in. battens on stall posts just above the skillion roof.

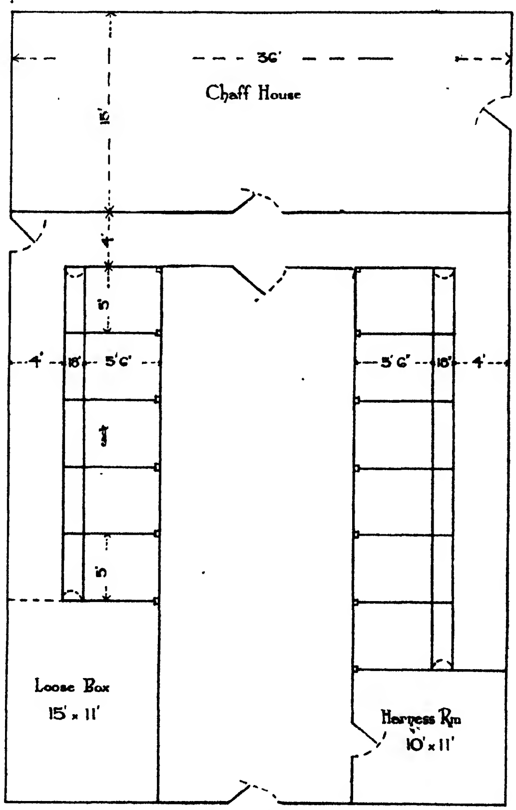
Iron in both walls and roofs to be nailed with spring-headed nails.

Valleys to be covered with 26-gauge galvanized plain iron and riveted and soldered at joints.

16-in. galvanized ridging to be used.

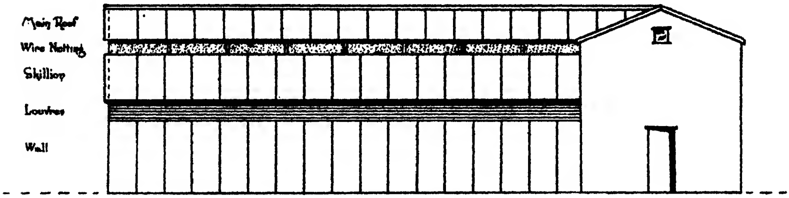


— ELEVATION —

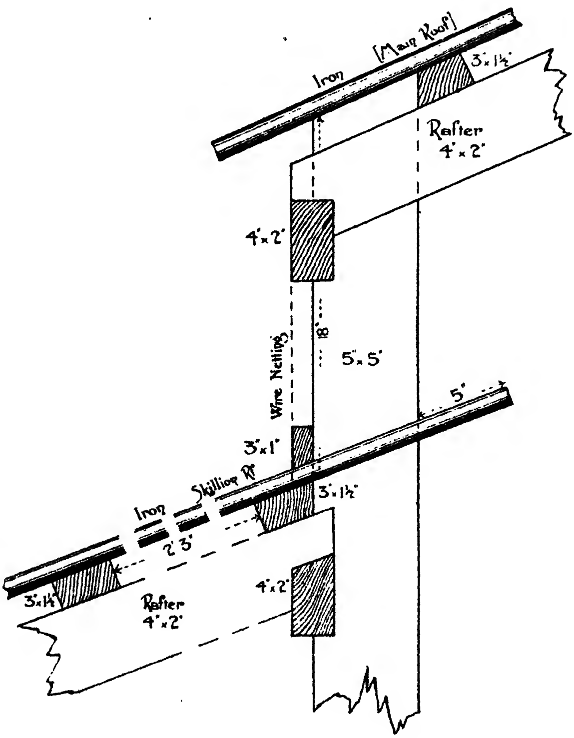


— GROUND PLAN —

In plan above the space allotted to the loose box is 15ft. x 11ft. Mr. Pope, however, suggests that 10ft. x 11ft. would be ample. If this suggestion be followed an additional stall could be provided.



— SIDE ELEVATION —



Spouting to be 4½-in. O.G. on skillion, eaves, and around chaff house. (No spout on main stable roof.) All spouting to be put on before roof iron, and to be affixed with straps of galvanized iron.

Facia, 7-in. beaded oregon. Barge and cap out of 6-in. x ⅞-in. softwood.

Mangers to be made out of 36-in. x 26-gauge plain iron, and to be 18 inches wide and 14½ inches deep, and 3 ft. 2 in. from top to block. A manger of similar material to be placed in loose box from side to side.

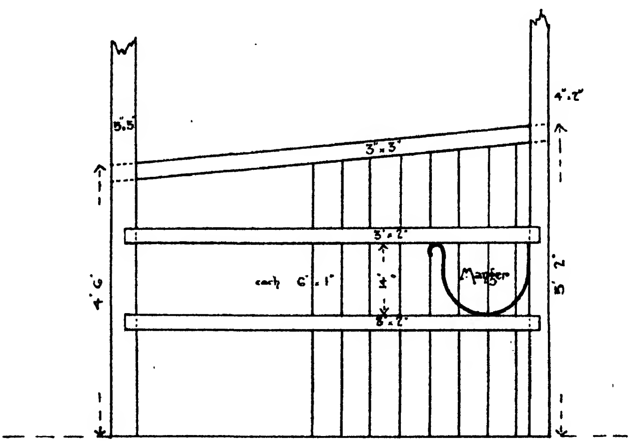
Windows—Fix one-half 8-in. x 10-in. sash in each gable end of chaff house.

Doors—Three double doors and four ledge doors. Loose box and main stable doors and end door of chaff house to be double doors 8 ft. x 4 ft. x ⅞ in. Each half door to be hung with one pair of Scotch tees, screws, and bolts. Each half to be fitted with Brenten's pad bolts. Doors of chaff house and side door of stable to be 7 ft. x 3 ft. x ⅞-in.; single hung with 18-in. tees and screws, and with necessary fastenings.

All doors to open inside.

Paint all outside wood and outside of doors and also spouting with three coats of paint.

Blocks to be provided by person for whom building is being constructed, and all material required to be carted by him to place of building.



— DETAILS OF STALL —

— Scale 3ft = 1 in. —

ORCHARD NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Planting.

The time has now arrived for the general planting of deciduous fruit trees. The soil should have previously been well ploughed and subsoiled, and, as far as possible, drained. To insure satisfactory results, it is essential that the orchard be subsoiled. Where expense is a consideration, drainage may be left for subsequent years, but once the orchard has been planted, it will be impossible to subsoil.

When planting out, the distance between the trees will be determined by the kinds to be planted. For ordinary deciduous fruiting trees it is the custom in this State to plant them 20 feet apart in the rows, the rows also being 20 feet apart. Results have proved this to be a satisfactory practice. Almond trees may be planted 15 or 16 feet apart each way, while walnuts and citrus, owing to their spreading habit, often require a distance of 30 feet.

Deep planting is not advocated, the general practice being that the depth of planting in the nursery should be followed. If holes be dug, they should be shallow, the bottom being merely loosened to allow a comfortable friable bed for the tree roots. A good practice is to dig the whole strip along which the trees are to be planted, merely removing sufficient soil afterwards when planting. Another satisfactory custom is to plough furrows 20 feet apart, and to plant the trees in the furrows, filling in the soil over the roots and trampling well down.

Before planting, the roots of the young trees should be well trimmed, shaped to an even form, and cleanly cut. As the result of their removal from the nursery beds, the roots are generally more or less damaged, and numbers of the fibrous roots, becoming dry, shrivel and die. These all require a clean trimming. Then it is often desirable to remove some of the roots so as to balance the root system. The trimming of the roots gives the young tree a clean root system, and it is enabled to establish itself with young, vigorous roots.

After planting, the top should be well cut back, so as to leave three or four arms, with three or four buds on each. Where it is not possible to have this number of arms or limbs it is frequently advisable to cut back to one stem, allowing the buds to break out strongly and frame the tree after planting. In some countries, the custom of not cutting back the trees the first year is favoured. Local experience has not resulted in favour of this practice, as it is found to be inadvisable to unduly strain the young tree by leaving a heavy top to be supported by the weak-growing root system.

A number of good commercial fruits have been found to be either wholly or partially self-sterile, requiring other varieties near them to enable them to set their fruit. For this purpose it is necessary that the bloom periods should be somewhat coincident.

Spraying.

The time has now arrived when it is necessary to spray for the following pests—scale insects, woolly aphis, and the bryobia mite. The use

of red oil has been advocated for these pests, and, as well, crude petroleum, kerosene and other oil emulsions have proved satisfactory.

The lime-sulphur spray is also one of the most effective of sprays for winter use. It is lasting, searching, and being a fungicide as well as an insecticide, is much favoured by growers as a dual spray.

GENERAL WORK.

All ploughing should now be completed; if not, it should be finished before spraying and pruning operations are proceeded with.

Any autumn manuring or liming should also be now carried out. This, too, should be finished before spraying or pruning. Before spraying with oils or with lime sulphur wash, all rough bark on apple and pear trees should be scraped off. This will mean the certain destruction of any codlin moth larvæ hiding underneath.

REMINDERS FOR JULY.

SHEEP.—Class all sheep, whether crossbreds or merinoes. Market any aged or inferior woolled sheep that may be fat before prices recede in the spring. Discard all undersized, narrow-framed sorts, any with short yellow fleeces, very coarse, common woolled crossbreds, any with very fine, mushy, light fleeces, ewes with deformed udders, single teats, deformed mouths, ewes six years old and over. When classing merino and comeback weaners look out for those thin and wasty on withers between the hips, and below; they are unprofitable shearing sheep. Draw teeth of aged ewes altogether if feed slipping through. Use a neat ear-mark for lambmarking, not the "slash," "crop," and other unsightly marks. Consider well before selling early-born, good-fleeced ewe lambs this coming season. Select best rams for future use, and dispose of any too old, or in any way undesirable. Remember wide, thick sheep are best thrivers, but they must carry superior bulky fleeces as well.

CATTLE.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of the young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Newly-calved cows should be fed liberally to stimulate milk flow. Cows may now be served for autumn calving. Calves should be provided with warm, dry shed.

VINEYARD.—Proceed with pruning, burning off, and ploughing. Though Anthracnose (black spot) did little or no damage last season, the disease must not be ignored; given suitable weather conditions and absence of preventive treatment, its re-appearance is almost certain. All susceptible varieties (sultanas, &c.), should be preventively "swabbed," just before the buds burst, with acid iron sulphate solution. Bulletin describing treatment will be posted on application. Complete as early as possible the application of manures if not already done. Mark out land for new plantations. If ground is in good order and not too wet, proceed with plantation of young vines (unpruned). Remove cuttings or scions from vines previously marked, and keep fresh by burying horizontally in almost dry sand in cool, sheltered place. Permanently stake or trellis last year's plantations.

Cellars.—Rack all young wines, whether previously racked or not. Rack older wines also. For this work choose, as much as possible, fine weather and high barometer. Fill up regularly all unfortified wines. This is a good time for bottling wine.

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PRESENT AND PROBABLE FUTURE DISTRIBUTION OF WHEAT, SHEEP, AND CATTLE IN AUSTRALIA.*

By R. G. Thomas, B.Ag.Sc., Science Field Officer.

Australia being essentially an agricultural and pastoral country, it was thought that considerable interest would attach to any method which would graphically and accurately represent the distribution throughout the continent of the units of the main primary industries; further, that such might give some insight into the possibilities of extending the various industries beyond their present boundaries and the direction in which such extension is likely to take place. With this object in view the accompanying maps were prepared showing the distribution of the units of the three principal primary industries, viz.. sheep, cattle, and wheat, in Australia (referring here and in all statistics to the continent of Australia, excluding Tasmania). The method adopted has been to represent a certain number of head of stock or acres of wheat by a dot placed on the map as near as possible to their situation, as indicated by official statistics; this gives a more accurate representation of the distribution than can be obtained by differential shading or colouring. Each dot represents respectively 5,000 acres of wheat, 10,000 head of sheep, and 1,000 head of cattle; these quotas are small enough to show a relatively sparse distribution, yet without showing too great an area where the dots run together, and no differentiation can be shown in the areas of concentration of the respective units. The statistics used were those for the year 1918-19, being the latest typical season for which details of all the States were available at the time the work was commenced.

Similar maps have been prepared by the United States Department of Agriculture, but it is hoped that, so far as Australia is concerned, those now published are not only based on later records, but more

* Read before Royal Society of Victoria.

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accurately represent the actual distribution of the units throughout the country.

Embodied in the maps are certain meteorological data relating to rainfall and temperature; such information is necessary for adequate consideration of the factors affecting the present distribution and probable extension of the industries. The data given consist of various isotherms (*i.e.*, lines of equal mean annual temperature) with the 5, 10, 20, 30, 40, and 60-in. isohyets (*i.e.*, lines of average annual rainfall) in the case of the two stock maps; and for the wheat map, the 5, 7.5, 10, 15, and 20-in. lines of winter rainfall, or more strictly the rainfall during the growing period of the crop, *i.e.*, April to October inclusive.

Acknowledgment is here made to the Government Statists of the various States and the Department of Home and Territories for supplying the statistics necessary to the work, and to the Commonwealth Meteorological Bureau for meteorological data used.

Wheat.

The total area sown to wheat for grain and hay in Australia, for the season 1918-19, was 9,647,433 acres, and of this total New South Wales contributed 3,227,374, South Australia 2,571,208, Victoria 2,488,810, Western Australia 1,336,502, and Queensland 23,539 acres. This area represented approximately 3.5 per cent. of the total area that year sown to wheat throughout the world. Until the last four seasons, which have shown a decline due to abnormal labour and marketing conditions, there had been a steady expansion of wheat growing in Australia, her production increasing from 1.6 per cent. of that of the world in 1906-07 to 4.8 per cent. in 1916-17, and it is hoped to show that there is ample room for this extension to continue.

In considering the distribution of the area as shown by the map (Plate I.), the most striking feature is the very limited extent of the wheat-growing country. There is, indeed, a distinct wheat belt forming a crescent-shaped area some distance inland from, and approximately parallel to, the south-eastern coast line, approaching and broken by the coast line as the latter turns northwards along South Australia, and continued again as a similar belt back from the south-western coast of Western Australia.

The factors limiting the distribution of the wheat acreage may be classed under two heads—natural and political or economic. The chief natural factors are the soil and climatic conditions of rainfall and temperature. The soil within any climatic region will vary widely in fertility, but it is safe to say that, within the regions to be indicated as suitable and not yet used for wheat production, though there are areas of low-soil fertility, there are many thousands of acres of which the soil is eminently suited to the growth of wheat; of the other two factors, rainfall and temperature, the rainfall, both in its total amount and incidence in respect to the growing period of wheat, is far the more important. Temperature, in fact, can be almost disregarded as a limiting factor; there is no extensive area of cultivable land in Australia which is actually too cold for the growth of wheat, though in our cooler districts various conditions combine to make it less profitable to grow wheat than other crops. Similarly, though wheat is not grown north of

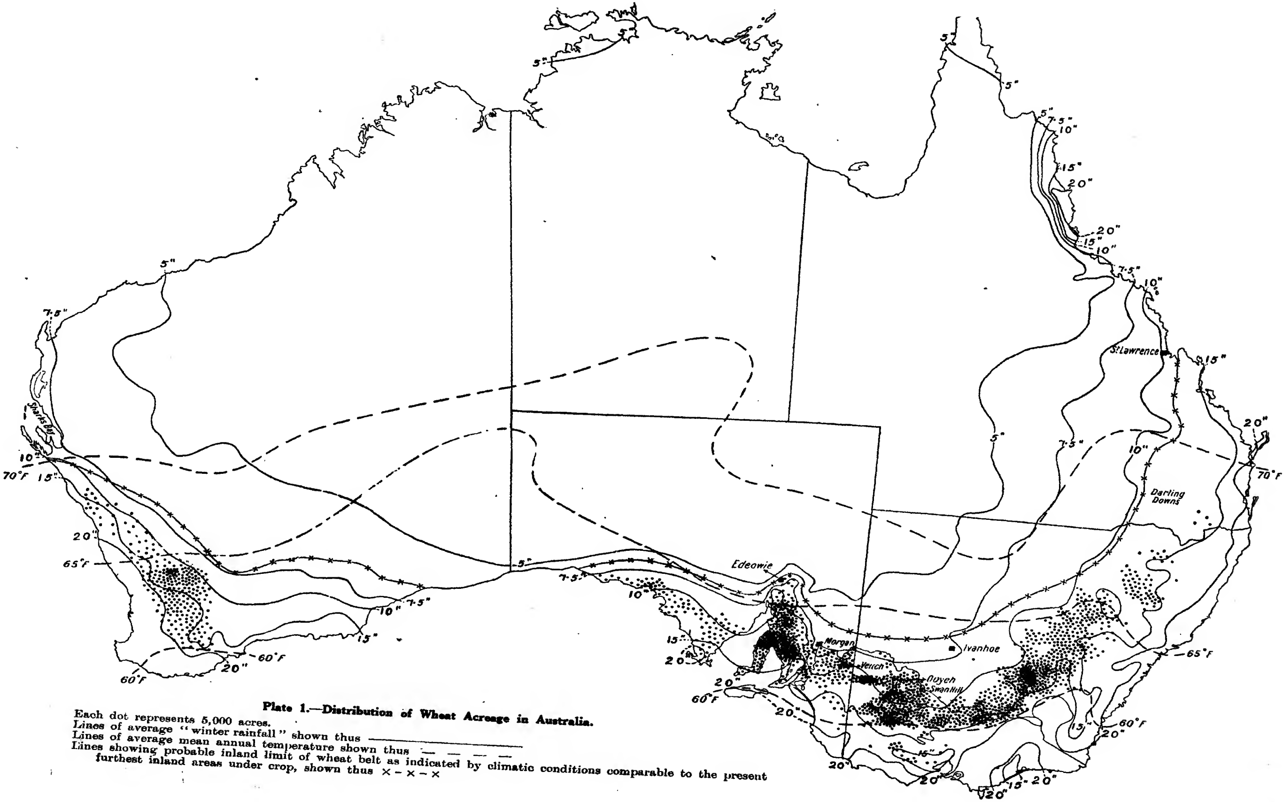


Plate 1.—Distribution of Wheat Acreage in Australia.

Each dot represents 5,000 acres.
Lines of average "winter rainfall" shown thus ————————
Lines of average mean annual temperature shown thus — — — —
Lines showing probable inland limit of wheat belt as indicated by climatic conditions comparable to the present
furthest inland areas under crop, shown thus × – × – ×

the 70 deg. isotherm, there is a considerable area north of this line climatically similar to the wheat-growing areas of India.* Here, again, it is the question of the degree of profitableness as compared with other agricultural and pastoral pursuits under our present conditions of development, rather than temperature, which limits the extension of the wheat area in a northerly direction. At the same time there is evidently an optimum condition of temperature for wheat in Australia, as practically the whole of the area sown to wheat is situated between the 60 and 65 deg. F. isotherms, there being a marked coincidence between the 60 deg. isotherm and the southern limit of the wheat belt.

Considering the distribution of acreage in relation to the more important factor of rainfall: the rain of importance to wheat is that received during the growing period of the crop, *i.e.*, April-October, inclusive, the rain falling through the summer being largely lost by evaporation, and also sometimes tending to reduce the wheat yield by causing lodging of the crop and the spread of rust. Therefore the lines of rainfall shown are those for this period. It is seen that practically all our wheat is now grown between the lines of 7.5 and 15 inches of winter rainfall. In Western Australia there is certainly a considerable area between the 15 and 20-inch lines, but here settlement is so sparse that more intensive agriculture has not yet pushed the wheat belt back into its true sphere in the dry-farming regions. In South Australia, Victoria, and New South Wales, the 15-in. line corresponds very closely with the southern boundary of the wheat belt, this line approximately separating the dry-farming areas from the closer settlement country, where more intensive farming is possible. The 10-in. line of winter rainfall has usually been regarded as the safe limit for wheat growing, but in South Australia and Victoria wheat is grown over a very considerable area inside this line, extending to and even passing the 7.5-in. line. The wheat-growing districts about Edeowie and Morgan, in South Australia, and immediately south of Mildura, in Victoria, are beyond the 7.5-in. line of winter rainfall; while between the 10 and 7.5-in. lines are the older settled Mallee districts of Veitch, Ouyen, and Swan Hill, where wheat growing has been an established and successful industry for over ten years. It can be fairly assumed then that country having a winter rainfall of somewhat under 7.5 inches, of reliablity equal to that in the areas indicated, and an average temperature not greatly above that of these areas, is capable of growing wheat under our present methods of cultivation and economic conditions of price of wheat, land, and labour. In New South Wales, the 10-in. line has not yet been passed, and it would seem that in the northern portion of the State it does indicate the probable limit of the wheat belt. The greater variability of the rainfall and the higher temperature, causing increased loss by evaporation, make a given average rainfall less efficient in crop production here than a similar amount in the cooler and more reliable rainfall areas in the southern portion of the State.

It is difficult indeed to indicate the ultimate inland limits of the wheat belt in Australia, for with improved drought-resistant varieties and better methods of cultivation, new areas are being brought under

* *Vide* Griffith Taylor—"The Australian Environment."

crop which but a few years previously it was thought impossible to successfully cultivate. This increasing efficiency will, it is hoped, continue. But, even with our present knowledge, there is ample room for expansion before what may be termed the probable limits of the wheat belt in the more immediate future are reached. The line shown thus — x — x — is an arbitrary line indicating what appears, from climatic considerations, to be such probable limit, and it is seen to enclose immense tracts beyond the present limits of development.

Commencing on the 10-inch winter rainfall line, south of Shark's Bay, Western Australia, where the variability of the rainfall is too great to warrant an extension to the 7.5-inch line, it passes west beyond the 7.5 line as the more reliable rainfall along the southern coast is reached. In this State alone we see a vast area of country awaiting exploitation, the greater portion of it having a winter rainfall equal in reliability and total amount to the well-developed wheat belt in Victoria. Along the west coast of South Australia this reliability of rainfall still holds, and here again might be expected a development beyond the 7.5 inch line, as has already occurred in the regions of less reliable rainfall about Edeowie. Passing over the extension of the belt north of Spencer's Gulf, the line turns southwards and runs somewhat north of the Murray and approximately parallel to the 7.5-inch line to about Ivanhoe, New South Wales, enclosing the immense tract of fertile Riverina country. Thence the line passes north-east beyond the 10-inch line, and north to St. Lawrence on the Queensland coast. As previously stated, the greater variability and higher temperature make the actual rainfall less effective than in the southern areas; hence this marked departure from the 7.5-inch line. As to the probable northerly limits of the belt, although there is a considerable area shown with a sufficient winter rainfall and where wheat can doubtless be grown, yet it seems unlikely that any considerable amount will be grown north of the Darling Downs, the high temperature, ample rainfall and its summer incidence combining to make wheat less profitable than other crops.

The present wheat belt as shown extends over an area of some 124,000,000 acres, of which only one acre in fifteen, or a total of nearly 8,000,000 acres, was under wheat in 1918-19. Since none of this is mountainous country and wheat is everywhere the principal crop, it might be expected that the area at present sown will be about trebled before this belt is utilized to anything like its full capacity. But apart from this area, there is in the probable wheat belt indicated further inland an area of some 138,000,000 acres. Assuming that this area can be developed only to the same extent as at present obtains in the Victorian Mallee, which is indeed a reasonable assumption when it is remembered that twenty years ago the advisability of abandoning the Mallee for settlement was seriously considered, and that even now but a relatively small portion of it is developed to any extent, this area would then carry a population of some 570,000, or 2½ people per square mile.

Aggregating the two areas, we have a wheat belt of over 260,000,000 acres. Of this we might ultimately expect at least 40,000,000 acres under crop each year; this, with an average yield of 10 bushels per acre, would give at least 400,000,000 bushels annually,

which, at the present Australian rate of consumption per head of population, and deducting the necessary quantity required for seed, would supply flour sufficient for the requirements of over 50,000,000 of people. It is not to be thought that even this is considered the limit of our possibilities as a wheat-producing country. It is a conservative estimate of the possible production from this area only, based on a low proportion of land under crop and a low average yield per acre. In the closer settlement country wheat can be grown in rotation with other crops under conditions of intensive agriculture; the acreage shown in these areas would not approach that of the wheat belt, but with a higher average yield per acre the production would be appreciable.

It is clearly evident that the factors determining the present actual limits of the wheat belt are economic and not natural ones. The limits on the coastal side of the belt are determined by questions of profit in competition with other crop and live stock industries; inland, practically in all cases by transport facilities. The most striking instance of this is in the undeveloped areas of Mallee land on either side of the Ouyen-Murrayville railway line. Again, the decided boundary in South Australia and New South Wales where the wheat belt stops at the Murray River, coincident with the limits of railway facilities. We have a long way to go in extending this, the chief present economic limit to the development of the wheat industry, before we approach the natural boundaries indicated above.

Sheep.

In the year under consideration, the sheep population of Australia numbered some 85,194,503, and of these New South Wales claimed 37,381,874, Queensland 18,220,985, Victoria 15,773,902, Western Australia 7,183,747, South Australia 6,625,184, and the Northern Territory 8,811 head. This number represents approximately 16 per cent. of the world's sheep, emphasizing Australia's position as a leading sheep and wool producing country.

Examining the distribution of the sheep throughout the continent (Plate II.), it is seen that the belt of maximum concentration is in South-eastern Australia, and that it coincides roughly with the wheat belt, the main departure being in the famous sheep country of the Western District of Victoria. The sheep-carrying country, however, extends much further inland and northwards than does the wheat belt. The area of maximum concentration commences in New South Wales, somewhat above the 65 deg. F. isotherm, and runs south-west through that State and Victoria on either side of the 20-inch line of annual rainfall. Such conditions of rainfall and temperature below 65 deg. F. are, given suitable soil, evidently the optimum conditions for sheep in Australia. From this region of maximum concentration there is a wide belt of decreasing sheep concentration extending inland beyond Oodnadatta and including the South Australian sheep country. The most noticeable breaks in this passage from the maximum to the minimum concentration are: (1) the low concentration areas of the Victorian and South Australian Mallee, where grazing to any extent is only possible after the land has been cleared and cultivated, and (2) the area of higher concentration where the rainfall isohyets run northwards of the Mount Lofty Ranges.

It is worthy of note that along the moister eastern side of the continent there are no appreciable numbers of sheep close to the coast line; not, in fact, until the belt of maximum cattle concentration is passed. The distribution of sheep is apparently limited here by the high rainfall, practically no sheep being found beyond the 40-inch line of rainfall. The liability to such troubles as foot-rot, liver-fluke, and other parasitic diseases is evidently one of the factors making the keeping of sheep in such districts less profitable than cattle raising.

Appreciable numbers of sheep are found as far north as Cloncurry and beyond in Queensland, and around Derby in Western Australia, both being about latitude 18 deg. S.; while, however, in Queensland the sheep do not extend appreciably beyond the 75 deg. F. isotherm, in Western Australia, the isotherms dipping south, they appear considerably above the 80 deg. F. isotherm. The temperature range of sheep is therefore considerable, as in the south-eastern corner of the continent they are found in country having a mean annual temperature below 55 deg. F.

In Queensland the greatest concentration of sheep is about Longreach, where, it is to be noted, there is a relatively sparse distribution of cattle. Over the rest of the State, inside the high rainfall coastal belt and south of the 75 deg. F. isotherm, the distribution is fairly uniform and comparatively dense. Western Australia has a small percentage of her total area as sheep-carrying country, and no region where the distribution can claim to be dense. The sheep belt is along the coast; here, however, except in the extreme south-western corner, a coastal region of low rainfall.

In considering the possible extension of the sheep-carrying areas, it may be noted that the extension during the last twenty years has not been very rapid, the numbers of sheep in Australia in 1900 and 1918 being respectively 70,602,995 and 85,194,503, or an increase of 20 per cent. as compared with an increase of 33 per cent. in human population. There is no reason why the numbers should not be considerably increased, both by the better management of present pasture lands and the opening up of new country.

The areas suggesting themselves as potential sheep country are (1) the Victorian and South Australian Mallee lands, where the stocking of the country does not, as is usual, precede, but follows on after the clearing and cultivation of the land. At present few of the Mallee settlers keep sheep, but with the passing of the pioneering stages of settlement the number of small flocks kept is gradually increasing. Better transport facilities, more than anything else, would greatly aid the development of this section. (2) There is a considerable stretch of country along the southern coast of Western Australia, bounded roughly by Southern Cross, Albany, and Eucla, which is practically devoid of sheep population. This is all within the 10-inch line of rainfall, and from climatic considerations above, it should have a carrying capacity at least equal to the South Australian west coast and other 10-15-inch rainfall areas. Indeed, compared with South Australia, where there is the greatest development of the arid country, we might look for an extension still further inland than the area indicated. Even allowing for a considerable proportion of inferior soil, there seems every reason to believe that this area is capable of supporting a population of sheep, certainly sparse, but aggregating many thousands of

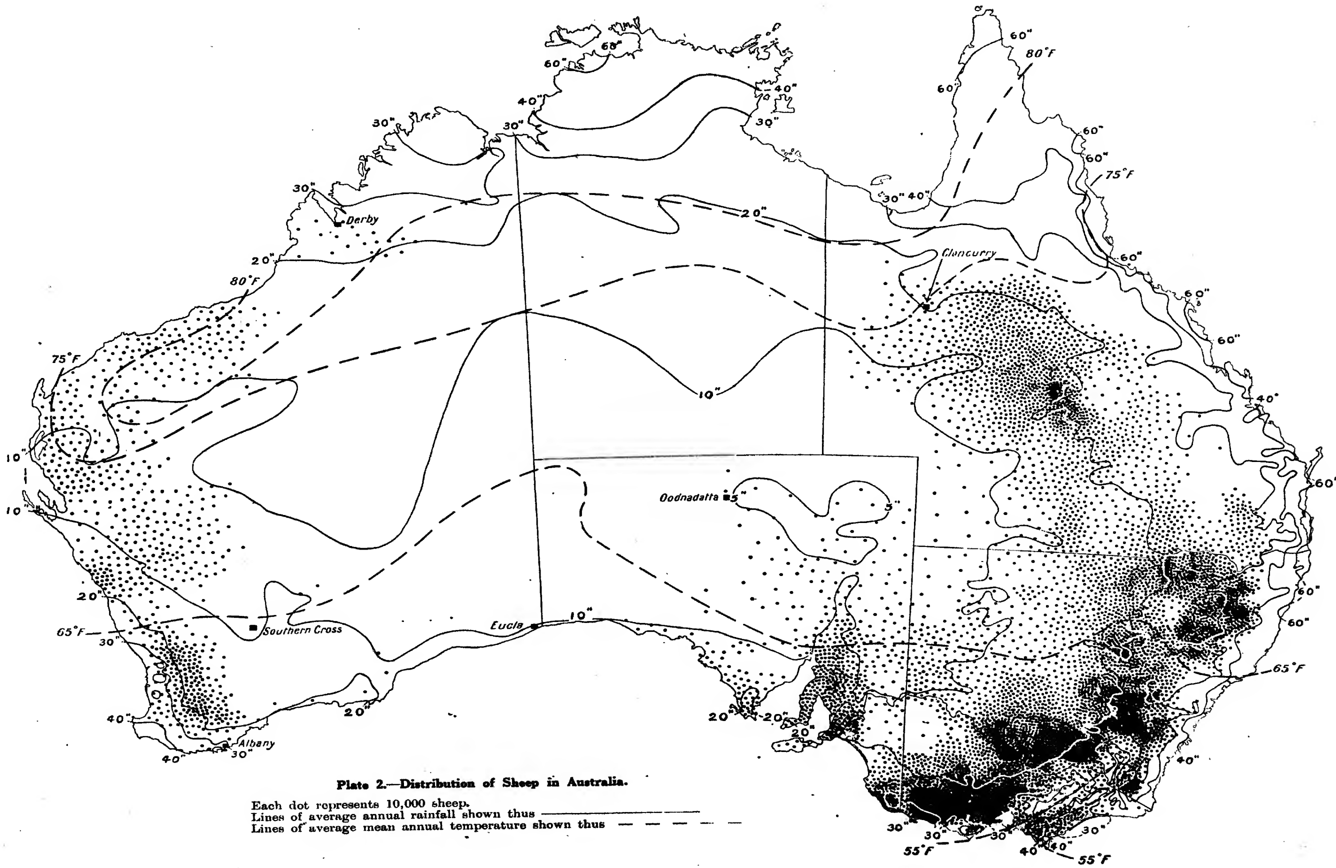


Plate 2.—Distribution of Sheep in Australia.

Each dot represents 10,000 sheep.
Lines of average annual rainfall shown thus ————————
Lines of average mean annual temperature shown thus — — — —

head. (3) In Queensland, the limits of the present distribution show a fairly sharp line both along the northern and western boundaries. Allowing that the high temperature and heavy rainfall combine to make a northern extension of the sheep belt unlikely, there remains between the Queensland western boundary of the present distribution and the sheep-carrying areas of the north-west coast an immense tract of country still to be exploited. The number of sheep in Queensland between the 10 and 20-inch lines of rainfall, and close to the 75 deg. F. isotherm, is seen to be comparatively dense, and it can be fairly assumed that such conditions of rainfall and temperature are quite favorable to the sheep industry. Between these lines of rainfall and approximating to the same temperature is a vast tract of country stretching across the Northern Territory and Western Australia. Large areas of this land are doubtless of a more or less barren nature, but it seems likely that with increased population and improved communication and transport facilities, this area will contribute appreciably to Australia's sheep products.

Cattle.

There was in 1918-19 a total of 12,576,842 cattle in Australia, of which number Queensland possessed 5,786,744, New South Wales 3,280,676, Victoria 1,601,544, Western Australia 943,847, the Northern Territory 621,163, and South Australia 342,768. These figures show an increase of approximately 46 per cent. on the total of 8,640,225 for the year 1900, being a much more rapid increase than that shown by sheep over the same period.

Examining the map of cattle distribution (Plate III.), the most noticeable feature is the very general nature of such distribution, cattle being found under very diverse conditions of rainfall and temperature, right from Darwin and Cape York Peninsula to the southern coast. The rainfall range is from 5 inches in the arid interior to over 60 inches on coastal Queensland and New South Wales, and the temperature range from over 85 deg. F. in the far north-west to below 55 deg F. in the south-eastern corner. The ability of cattle to withstand both cold and heat, and their great travelling capacity, making them invaluable in the pioneering stages of a country's development, are here emphasized. Compared with the distribution of sheep, they not only show this wider range, proving their greater adaptability to varying conditions, but also the regions of maximum concentration differ markedly from those of sheep. The areas of maximum concentration are found along the coasts of New South Wales and Queensland, commencing just outside the sheep country and in districts having a rainfall of 40 inches and over. Under such conditions cattle-raising and dairying, as compared with sheep, are evidently so much more profitable as to practically totally exclude the latter. The next greatest concentration is found in Gippsland and the Western District of Victoria, with temperate climate and rainfall of 30 inches and upwards, but in these areas sheep also are found.

The influence of the big capital cities in increasing the cattle population (for dairying and fattening purposes) is clearly shown in the comparatively poor country north of Melbourne, and to a lesser extent around Sydney and Brisbane. The irrigation of the drier areas has a

like effect, as shown by the relatively dense population of cattle in the County of Gunbower, Victoria, where the annual rainfall is under 15 inches. The effect of varying soil fertility and topography is strikingly shown in Queensland, where between Dalby and Gayndah, within a relatively short distance and under much the same conditions of temperature and rainfall (about the 20-inch line); we pass through a region of maximum concentration to one of very sparse distribution, and again through a maximum concentration area.

What may be called the inverse distribution of sheep and cattle holds throughout, for it will be seen that in Central Queensland and New South Wales, and in Western Australia, where cattle are relatively sparsely distributed, sheep are relatively dense, and *vice versâ*.

As regards the possible extension of the present boundaries of cattle distribution, it is seen that the eastern half of the continent is practically totally inhabited, and development is here limited to the closer population of already inhabited areas. In the western portion, however, there are vast unoccupied areas, a large proportion of which show promise of carrying, in the future, a considerable number of cattle. Climatically, there seems no reason why the cattle population of Queensland inside the 20-inch line of rainfall should not extend across the similar belt through the Northern Territory and Western Australia. The regularity of the rainfall over most of this area is quite as great as in some of the well-populated country of Queensland with a similar annual total. Artesian and sub-artesian water has helped greatly in the latter region, and there seems every prospect of this being obtainable over much of the country indicated. Then there is the south-western portion of the continent having a rainfall of over 10 inches, and here of great regularity, to be regarded as the potential carrier of a sparse cattle population, with the possibility of a concentration in the extreme south-west corner where the rainfall is over 30 inches. Here there are now, relative to the rainfall, very few cattle, the country in its natural state being unsuited to grazing; but with the progress of agriculture there is every reason to expect a rapid increase in the numbers of cattle maintained in this well-watered region.

A word as to the agricultural potentialities of Australia as indicated by this cattle distribution map. It is an axiom among stockmen that "cattle country is good country"; and when we consider not only the great concentration along the fertile coastal belt of the continent, but also the vast areas of New South Wales, north-west Australia, and particularly Queensland, carrying, relative to their human population and stage of development, a dense and uniform stock population (for it must be remembered that sheep largely fill up what appear to be the blanks in the cattle map), we can see room for a tremendous increase in the number of Australia's people, her stock and agricultural industries, before there is need to seriously consider how we are to support her excess population in that arid interior of which we are frequently reminded. Even in this arid interior we find, along the only long established line of communication, viz: the Oodnadatta railway line and telegraph line to Darwin, some cattle; and it seems evident that, as our knowledge of the country and facilities for communication and transport improve, much of this land will carry stock in numbers quite sufficient to repudiate the name of desert.

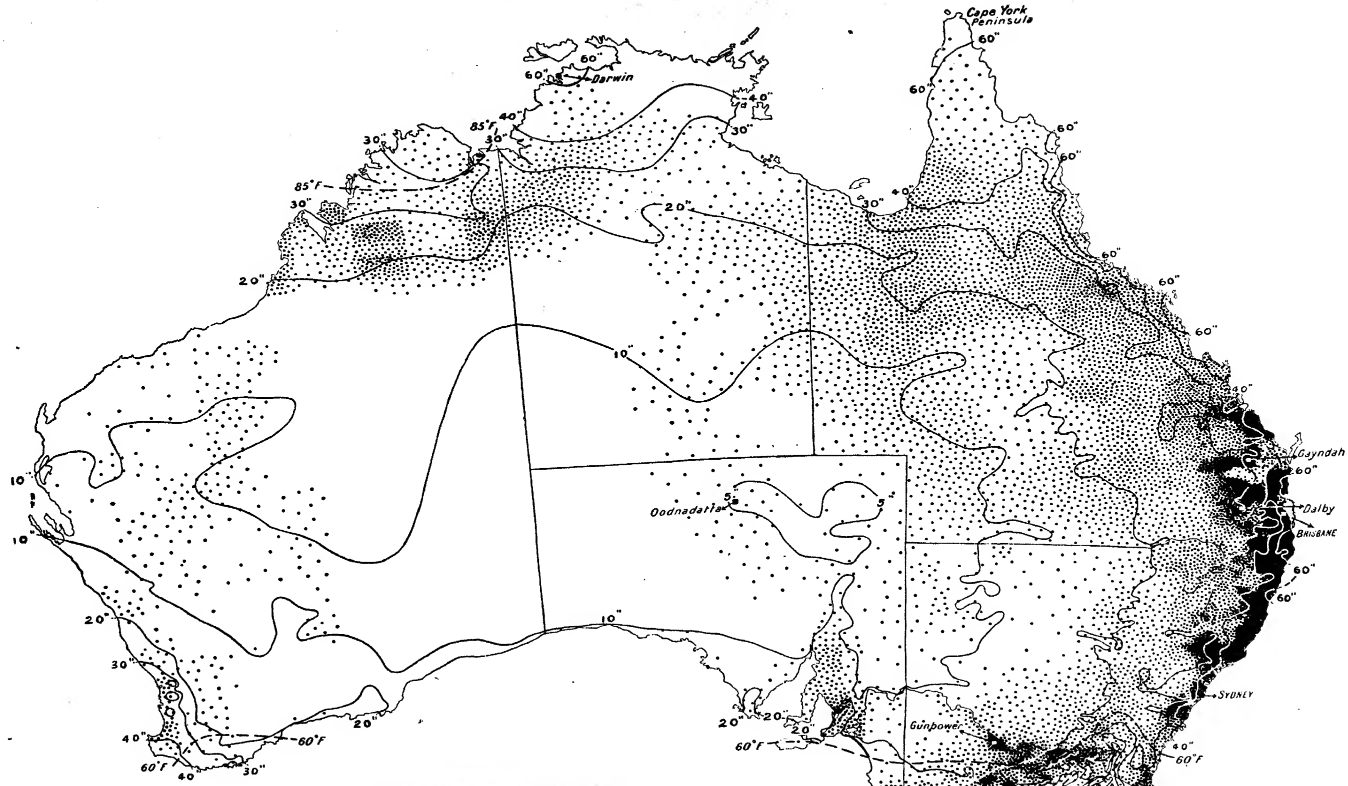


Plate 3.—Distribution of Cattle in Australia.

Each dot represents 1,000 head.
Lines of average annual rainfall shown thus ————
Lines of average mean annual temperature shown thus — — — —

THE SNOWY RIVER FLATS AT ORBOST.

By L. C. Bartels, B.Ag.Sc., Science Field Officer.

Maize Growing.

Victoria has many areas of rich agricultural land, but none more renowned for fertility than that area of 35,000 acres around Orbost, in East Gippsland, known as the Snowy River flats.

Orbost is situated in picturesque country, and is 10 miles from the mouth of the Snowy River. The hills bordering the valley are heavily timbered, and there is profuse growth of vegetation everywhere.

The river in its course traverses the volcanic areas of the Monaro plateau, and lower down passes through Buchan limestone country. From these sources, as well as others, the soil on the flats has been built up. Most of the land is subject to floods, and there is evidence of the amount of silt carried by the river in the extensive depositions recently made. Huge tree trunks are found buried at considerable depths, and boring operations carried out in one place to a depth of over 100 feet showed that the deposits are uniform to that depth. It is asserted that in places, as at Bete Bolong South, from 6 to 10 feet of silt has been laid down within the last forty years. The newer deposits are not at once as fertile as those of earlier origin.

On the Orbost flats, there are two main types of soil—sandy loam and clay loam. When the flood waters spread across the flats, the heaviest particles in suspension settle first, and on the river frontage the soil is a sandy loam, while the finer material is laid down further from the river banks. In the morass country, which extends to the hills, the soil has been built up by sedimentation, and accumulation of organic material. Some peaty land exists. This morass or river swamp country is the more extensive, the proportion to the frontage land being about 3 to 2. Both are good soils, but in its natural state the morass land looks uninviting. When it is grazed, the trampling of stock produces small hummocks with coarse vegetation. By drainage and cultivation it is transformed into wonderfully fertile land. The hummocks, which are really big tussocks, are ploughed out and broken up, and afterwards the land is fairly easily cultivated. Considerable improvement is effected if the floods carry silt on to morass land.

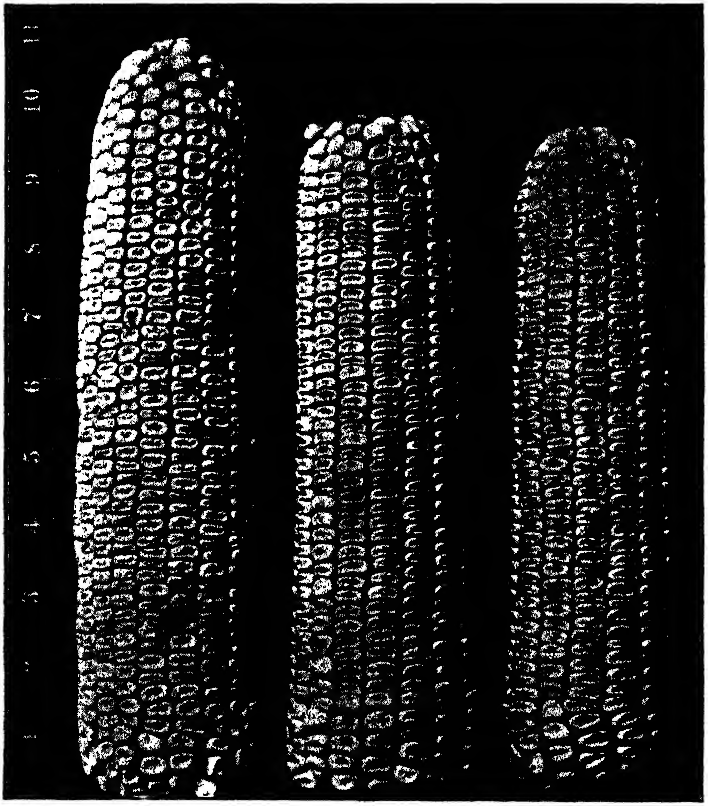
At Orbost, maize-growing is the most important industry, and 600,000 bushels is the average annual production. Authentic yields up to 125 bushels per acre have been obtained, and it is claimed that yields of 145 bushels per acre have been reached. A fair amount of dairying is carried on. Pig-breeding has always been an important industry, and beans are grown by most farmers.

Much of the land is continuously cropped, and some fields have been growing maize for thirty or forty years.

The cultural methods adopted in maize-growing are fairly uniform, although they have to be modified slightly on some types of soil. When picking is finished, cattle are turned into the maize fields to graze. The stalks left standing are then knocked down. Most farmers rake and burn them, but some growers chop them up and turn them in with a disc plough. In some cases, an implement with straight-fixed discs, set about 7 inches apart, is used to chop up the stalks before ploughing.

Some farmers assert that the ploughing-in leaves the ground too open; certainly, it renders subsequent operations more difficult. Ploughing is followed by disc cultivation, disc harrowing, rolling, or levelling.

Sowing commences in October. All maize is machine-planted, and, on the average, 14 lbs. of seed per acre is sown. The field is harrowed soon after planting till the young plants appear. This particular operation is of great importance in suppressing weeds. Horse-hoeing follows, and this is carried on till the maize is from 3 to 4 feet



Cornplanter Maize, grown at Orbost, 1922.

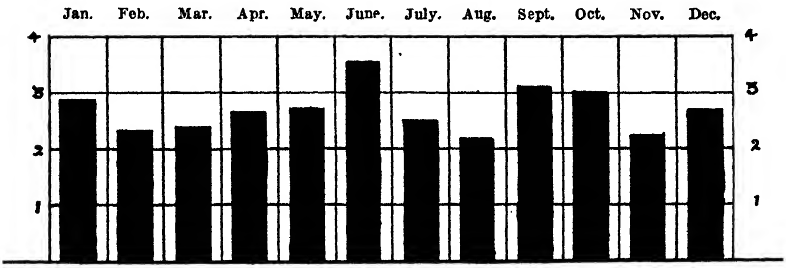
high. More attention is being given to this work, with a view to minimizing the amount of hand-hoeing necessary later on. It is found that some weeds may be smothered when young, and advantage of this is taken in the practice of moulding between rows. It has been shown that one man can keep 50 acres of maize in good order.

Weeds grow strongly. Prince of Wales' Feather (*Amaranthus*) is considered the worst; Thornapple (*Datura Stramonium*) is a bad weed; Fathen (*Chenopodium glaucum*), and Cockshin (*Panicum Crus*

galli) are abundant, while *Galinsoga parvi flora,* locally known as Peterson's pest, is becoming common.

In April, maize begins to die off, and picking commences. It may be understood that, in a district such as Orbost, where extensive areas of maize are grown in proximity, the different varieties are not well defined. Through the enterprise of Mr. H. James, and others, several kinds have been introduced as the result of selection, or by importation from America. It cannot be said that close attention is paid by growers to the selection of seed. The practice everywhere is to select from the crib, and farmers generally strive for high yield, without particular regard to type. By continued selection, different men have evolved fairly uniform types, but opinions differ slightly as to what constitutes the true type of any particular variety. Weight of cob, with deep grain and accompanying small core, is sought.

Sibley is the variety commonly grown. It is a mid-seasonal yellow Dent maize. Funk's Yellow Dent, Brewer's Dent, and Early Yellow Dent are also grown. Cornplanter, a white Dent maize, is being grown in increasing quantities, and it is considered to be a better variety for frontage land. Hickory King is grown mainly for seed; it commands



Graph showing the average distribution of the rainfall throughout the year at Orbost over a period of 32 years. Average, 31·89 inches per year.

a higher price than other maize. There is practically no flint maize grown, although Long Tom and Ninety Day, both flint varieties, were the first introduced.

Leaming and Ried's Yellow Dent were originally the two main varieties in the United States. The development of these was carried on in families. Their characteristics are continually manifesting themselves in the newer varieties.

James' Eclipse was Leaming, selected, and made uniform.

Sibley has been developed from Ried's Yellow Dent; Funk's Yellow Dent and Brewer's Dent were bred from Ried's Yellow Dent by Funk Bros. and Brewer, respectively.

Cornplanter was developed by Mr. H. Field, of Shenandoah (Pennsylvania). Twelve cobs were exhibited in a competition for which the prize was a cornplanter. These twelve cobs were awarded the prize, and were purchased by Mr. Field, who evolved the variety from them.

The heavy yields of maize obtained at Orbost indicate that almost ideal conditions exist there. Some of the factors which contribute to this are the depth and texture of the soils, with their high capacity for retaining moisture—there is an annual rainfall of nearly 32 inches

regularly distributed throughout the year. The atmosphere is humid, and in summer heavy dews occur.

Bean-Growing.

Bean-growing is an important industry at Orbost. Most farmers grow beans as a side-line. The main purpose is the production of seed, which is supplied to the Melbourne seed merchants, and by them delivered all over Australia.

French Canadian Wonder beans are mostly grown, but other varieties referred to as fancy beans are grown extensively. The conditions are favorable for the production of the highest grade of seed, and the superior quality attained has set a very high standard. Canadian Wonder is a difficult bean to grow. Seedsmen desire a dark bean, although it must be stated that it does not give a better germination, or even a superior crop. Other beans are not so difficult to produce, and a second-rate soil gives a good quality. Other parts of Gippsland offer good conditions for most varieties, but not always for Canadian Wonder beans. The industry may be developed, but the local demand can be quickly overtaken. It is possible that an export trade could be developed.

The yield from a good average crop is up to 40 bushels per acre. The price fluctuates with the supply. The weather may spoil the crop in a district. At present, they are worth 25s. per bushel, but they have brought £4. Some growers sell the green pods, and put in 3 or 4 acres for the purpose.

It is desirable that the beans should be harvested in February or March, and the endeavour is made to have them sown in the beginning of October. The seed bed must be fine. The beans are planted with a maize planter in rows 2 feet to 2 ft. 4 in. apart. One and a quarter bushels of seed per acre is sown, which is allowing one bean for every 3 or 4 inches. The surface of the soil may crust, and the seed leaves of the young bean may break off. To guard against this, shallow sowing is the rule, and a light onion harrowing is given when the seed has germinated. Horse-hoeing and hand-hoeing are practised. When the plant is at the flowering stage, "rogueing" is carried out. The bush beans and runner beans may be distinguished then, but other variations must be watched for at podding time.

When the plants begin to die off, they are pulled instead of being left till they are dead ripe. The ripening is finished after pulling. The beans are very susceptible to damp, and will easily become mildewed.

In warm weather, the beans shed from the pods very easily, and so they are nearly all hand-pulled. They are left in the field with the roots uppermost, and after a week they are carted for thrashing. If conditions are favorable, they are thrashed in the field, and the method of thrashing is to spread them on a sheet, where a roller is driven over them. After this, the beans are bagged, and a lot of dust and leaves, &c., is left with the seed to absorb excess moisture, and here they complete the ripening, and even darken in colour. After thrashing, they are winnowed, and are then picked over so that split seed and flat and discoloured beans may be removed. Five or six shillings a bag is paid for this operation.

Mr. James has an up-to-date bean-cleaning plant, which does the work efficiently at a reduced cost. The beans are first winnowed by a machine, in which the speed of the fan can be easily altered. In a subsequent operation, they are mixed with damp and then dry sawdust. This polishes dirty and mildewed beans. Another ingenious machine locally devised is called the Separator or Gravitation Table. This consists of a moving sheet, the surface of which slopes in the direction at right angles to the direction of movement. The beans pass on to this table, and split beans and flat beans are carried over the end, while the rounder and heavier ones slide off. Hand-picking is the final operation.

Fourteen or fifteen varieties of beans are grown at Orbost, including dwarf and runner green beans, and wax-pod or butter beans. The main variety grown is Canadian Wonder, and, as previously stated, seed production is the chief object.

(a) (b)
Cross-section of Ears. (a) Hickory King. (b) Cornplanter.

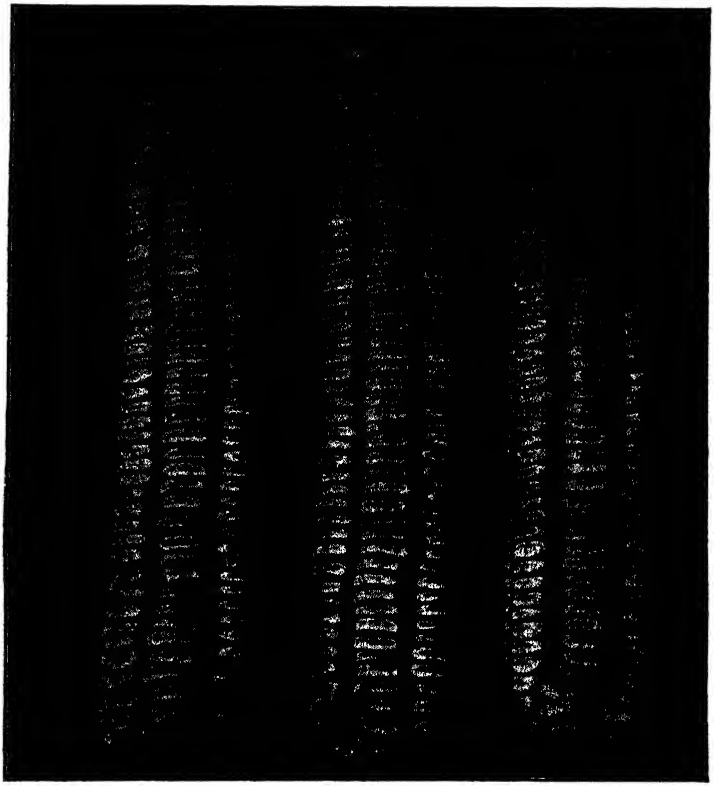
Maize-Growing on Lindenow Flats.

In the valley of the Mitchell River there are about 10,000 acres of river flats, of which about 6,000 acres are devoted to maize-growing. The Lindenow flats, near Bairnsdale, rank next to Orbost as a maize-growing district. The flats are not as productive as those along the Snowy River. These latter are of more recent origin, and the repeated siltation maintains their fertility. At Lindenow, there is a depth of from 10 to 12 feet of soil overlying coarse gravel. The rainfall, 28 inches per annum, is lower than at Orbost; but if rain comes at a favorable time, very high yields of maize are obtained—60 to 70 bushels is the average. In exceptional cases, over 100 bushels have been obtained.

The soil on the flats varies from fine sand or silt to clay loam. The silt, which is of excellent quality, borders the river, and further away is the black, heavier soil. In this latter area are depressions or "gullies," where the soil is very fine. The soil in these gullies is most productive. In addition, there are patches of soil with a slight chocolate tint—these are relatively "poor" areas.

The success of maize-growing at Lindenow depends on effective conservation of moisture. This is achieved by early and deep ploughing, with repeated cultivation.

The stalks of the old crop are broken down with harrows, raked together with a tumbling rake, and burned. (It is considered that repeated ploughing-in is associated with the occurrence of fungus diseases and caterpillars). Those that remain are chopped up with the cutter designed for the purpose. Incidentally, this gives a light cultivation, and prevents the formation of clods. The land is then



Ears of Hickory King Maize.

ploughed to a depth of from 6 to 9 inches. If the disc plough is used, it ploughs up the land without altogether inverting the soil. The packer roller follows, then the disc or spring-tooth cultivator, and harrows.

At Lindenow, particular care is given to the preparation of the seed bed; this facilitates cultivation when the crop is up. In places, superphosphate is applied at the rate of from 80 lbs. to 112 lbs. per acre. Commonly, three grains are set in a hill, but some growers would prefer

two. Sowing is done in October. The first harrowing is given from five to twelve days after sowing. This is the most important operation; harrowing may be continued at intervals till the maize is 7 inches high. The farmer does not wait for weeds to appear, but repeatedly cultivates the land, and endeavours to smother weeds by "moulding" the soil between the rows. Discretion must be used if roots are being damaegd, particularly in a dry season.

Sibley is the maize commonly grown at Lindenow. Different varieties have been introduced from time to time, and inter-breeding has produced various types. Some white maize is grown, but the area given to it is decreasing. There is probably little difference in yield between it and red maize, and no particular objection to white maize is offered.

Seed is selected from the crib, and the farmer looks for deep grain on a well-filled cob. Roughness of dent is associated with depth of grain, but also usually with thinness. Thickness of grain is desirable, but this characteristic is often linked with shallowness of grain, and continued selection of thick grain would reduce the yields; but, by retaining for seed some cobs with long thin grain, crossing maintains an intermediate condition.

At and around Lindenow is undulating country, with sandy soil on the hills and clay land at the foot. This land is typical of thousands of acres in Gippsland. Heavy timber grows on these areas. Stringybark and sheoak on the hills, and redgum on the stiff soils. These stiff soils, when cleared, grow winter fodder, and will also grow good wheat; but rust is prevalent. The light soils on the hills are covered with bracken. When cleared they are very productive. They vary from rather poor gravelly soil on some of the hill-crests to nice sandy loam. They bear fair maize crops.

Prime maize-growing land in Gippsland is limited, and it is on these hills that extensions will be made. Notable examples are presented by men who have cleared this land and are attaining yields of from 35 to 50 bushels of maize; and instances are quoted where 70 bushels per acre have been obtained.

Conclusion.

Orbost and Lindenow have long been famed for maize-growing. Bean-growing at Orbost is assuming more importance of late years. As might be expected, the maize yields at Orbost range amongst the highest attained anywhere in the world.

Over 80 per cent. of the maize produced in Victoria is grown in East Gippsland, and in the season 1920-21, the amount produced in the State was 1,066,000 bushels, with an average yield of 44 bushels per acre. This is low, and shows a decline on the average production of earlier years.

At both Orbost and Lindenow, the cultural processes adopted are of a fairly high order; although, in both places, there are farmers whose methods surpass those of their neighbours.

Besides being used for fodder, maize yields a number of products, including cornflour, glucose, and oil, and the by-products obtained in the manufacture of these are useful stock feeds. Maize-growing is capable of expansion and of improvement; but Orbost and Lindenow, and the other river flats, with their great natural advantages, will always be the main centres of the industry in Victoria.

CROP AND FALLOW COMPETITION, HORSHAM, 1921.

Report of the Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer.

This year there were seventeen entries for the Crop and Fallow Competition conducted by the Horsham Agricultural and Pastoral Society. This may seem a small entry for a progressive district like Horsham in a season like the past, where 40-bushel crops were fairly common; but it must be remembered that this year the Society also instituted another type of competition, for which more substantial trophies were given. Prizes valued at £60 were offered for the best bag of commercial wheat as received from the harvester, the object being to improve the commercial sample of the district. This competition attracted a very large entry, so that it cannot be said that any lack of interest is shown in educational movements among farmers at Horsham.

The average rainfall received last year was 19.4 inches, of which 11.6 inches fell in the growing period of the wheat crop, which at Horsham is June to November.

The crops were regularly prolific throughout the district. They were exceptionally free from diseases such as flag, smut, and take-all, though a little red rust was present. A number of them were on the rank side—in a few cases they were down in patches. Some very high yields were recorded. In one authenticated case an average of 50 bushels per acre was secured by Messrs. Hobbs and Knuckey over 160 acres. Some 250 acres of Federation at the Longerenong College averaged 45 bushels per acre, and the whole area sown (380 acres) yielded at the rate of 42 bushels per acre; nor were these the only cases.

But where the proper methods are adopted there is nothing exceptional about these results at Horsham on this soil, for yields of that order have often been secured by the best men during some years past. Compared, however, with the crops grown 20 years ago, there is a wonderful improvement. Then a 20-bushel crop was a good one. The intervening period has witnessed many changes. First there came superphosphate, then fallowing, then Federation wheat, then thorough cultivation, heavier seeding, and finally late sowing. All of these innovations have been contributory factors in raising yields to their present high level. But the average farmer at Horsham cannot claim to have reached the highest limit possible. When he raises his rate of seeding to 80 or 90 lbs. per acre for late sowing, and the amount of manure to from 1 cwt. to 1½ cwt., when he introduces summer fallow and systematically works it, when he cultivates the fallow to till it as well as to kill weeds, and when he pays more attention to systematic crop rotation, then heavy yields will become general.

The soil at Horsham is both rich and deep; it is the kind of soil that it pays to farm well.

Results.

SECTION I.—CROP AND FALLOW COMPETITION.

For the highest aggregate award for 100 acres of fallow 1920, and for the crop grown on the same fallow 1921.

Messrs. Miller Bros. secured the highest aggregate, 190 points, over the two years, 97 points being gained for the fallow in 1920 and 93 points for the crop 1921. G. W. Hobbs was second with 91 points for fallow and 94 for the crop, totalling 185 points.

Other good crops were exhibited by Messrs. Worth Bros. and Messrs. Smith Bros. (Glenburnie). One paddock of 40 acres entered by Messrs. Smith Bros. (Waverley) was also very heavy. The crop shown by Mr. H. Klous, grown on heavy crab-holey country near the Wimmera River, had gone down badly.

Heavy Crop of Federation (Messrs. Miller Bros., Horsham).

Messrs. Miller Bros.' crop was uniformly good. The yield was heavy, the seed reasonably true to type, there was a complete absence of weeds, and no disease was noticed. While lacking somewhat in density, nevertheless there was no excess straw and the heads were well filled. These two latter characteristics are usually indicative of good yields. The method adopted in raising this crop was as follows:—The paddock was winter fallowed in July to about 3 inches deep; then it was harrowed twice. In September the scarifier was used to kill weeds, and then two strokes of the harrows were given. Sheep were allowed access to the fallow, which was not again cultivated until the following autumn. The paddock was scarified in April and re-scarified in front of the drill late in June. At the end of June it was seeded with 80 lbs. of Federation wheat obtained from the Longerenong College, and 90 lbs. of super. per acre applied. Weeds appeared later, and two light strokes of the harrows were given. The weeds were killed, but apparently some of the wheat was thinned out. It will be noticed that no less than ten cultural operations were given this field in preparation for the crop.

Mr. Hobbs' crop was the heaviest seen in the competition. Some mustard seed was present, for which points were deducted. This was an exceptionally short crop. It was drilled during the second week in July and was "sheeped" during part of August. Mr. Hobbs believes in thorough ploughing and scarifying. The fallow was ploughed in July to 4 inches deep, then it was harrowed twice. In September, early, a scarifying was given, and another in October. In January and again in March the harrows were kept going to fill cracks. In May the fallow was scarified up and then the weeds allowed to germinate. The scarifying was repeated in July and the paddock was drilled a week later; 60 lbs. of seed were used, with 90 lbs. superphosphate. Mr. Hobbs follows the method successfully practised at Longerenong College of scarifying the fallow twice in the spring and twice before seeding in the autumn. Ten workings in all were given. Federation was the variety grown.

A Fifty-bushel crop grown by Messrs. Hobbs and Knuckey, Horsham, 1921.

Messrs. Worth Bros.' crop was the new variety raised by Mr. A. Huff, and known as Huff's Imperial. It is a short strawed, very compact, red variety obtained as a selection from Federation. The fallow was winter fallow, ploughed to 3 inches and carefully worked. Seven separate strokes with the harrows were given, but only two scarifyings; 90 lbs. of seed per acre and 100 lbs. of superphosphate were applied.

The crop of Federation shown by Messrs. Smith Bros. (Glenburnie) was one of the heaviest seen. It is the product of a special system which they practise with success. The plough and scarifier are wholly relied upon and the harrows dispensed with, their place being taken by sheep, which are, of course, singularly effective in breaking down Wimmera fallows if left rough. Messrs. Smith Bros. consider the tramping of the sheep especially beneficial in securing the required consolidation on these friable soils. They crowd sheep on to their fallows for the express purpose of tramping it. The following is the treatment given the

crop. Early in August the paddock was ploughed to about 3 inches deep. In September and again in October the scarifier was used to give a thorough cultivation. Sheep were then allowed access. In April the scarifier was used, and again in June. The paddock was seeded late in June with 60 lbs. wheat and 80 lbs. superphosphate. It may be noted, however, that Messrs. Smith Bros.' land is not typical of the Wimmera plains as a whole. It is exceptionally deep and rich.

DETAILS—SECTION I.—CROP AND FALLOW COMPETITION.

Prize for highest aggregate award for 100 acres of Fallow 1920, and for the crop grown on the Fallow 1921.

Name.	Yield.	Trueness to Type.	Disease.	Weeds.	Evenness.	Total for Crop, 1921.	Total for Fallow, 1920.	Grand Total.
Possible points ..	**35**	**20**	**15**	**15**	**15**	**100**	**100**	**200**
Miller Bros. ..	31	19	15	14	14	93	97	190
G. W. Hobbs ..	35	18	15	11	15	94	91	185
Worth Bros. ..	32	16	10	12	15	85	94	179
C. Reinheimer ..	31	19	10	11	15	86	91	177
Smith Bros. (Waverley)	31	19	15	13	13	91	87	178
Smith Bros. (Glenburnie)	33	17	11	13	14	88	88	176
H. Klous ..	29	19	14	14	8	84	87	171
A. G. Turnbull ..	24	17	14	12	10	77	73	150

SECTION 2—CROP AND FALLOW COMPETITION—FALLOWS, 1921.

The crops grown the coming season on the various fallows shown should afford interesting comparisons. Of the nine entries submitted, five were summer-fallowed and four were winter-fallowed. Some paddocks had had as many as eight separate strokes with cultivation implements, while others had been given only four. Two of the fallows had been prepared without the use of the plough at all.

Messrs. Murray Bros.' paddock of summer fallow was placed first. This paddock was in excellent condition. The mulch was deep, mellow, and in particular the bottom of the seed bed was level and firmly consolidated. A point or two was deducted for the presence of weeds. This paddock had been thoroughly ploughed in the first instance in March to 4½ inches deep. In July it was scarified, in August harrowed, and then re-scarified. In October and also in December it was harrowed.

Messrs. Worth Bros.' fallow, awarded second place, received seven workings, but it was not at any time ploughed. In March it was scarified, which operation was repeated in July. Then two strokes of the harrows were given. In September another scarifying took place, followed by harrows. In November the paddock was re-scarified and then harrowed. The result was an excellent fallow.

Messrs. Miller Bros.' fallow was winter-fallowed in July; if anything, the mulch was on the shallow side. Spear thistles made their appearance in great numbers in December, but were effectually dealt with when small with the aid of a "knife" attached to the scarifier.

Messrs. Lehmann Bros. also used the "knife" to cut weeds on the fallow. An illustration of this type of implement accompanied the report of the Nhill Farm Competition printed in this *Journal* for March last. The knife has the advantage of cutting every weed and at the same time not stirring the soil too deeply.

Judging by the fallow seen, there is considerable local divergence in the methods used for creating and maintaining the fallows at Horsham. It is probable that one of these methods is superior. The land is heavier than most in the Wimmera, and it is obvious that methods standardized there do not necessarily apply here.

DETAILS—SECTION 2.—CROP AND FALLOW COMPETITION.

Fallow ploughed 1921. Crop on the Fallow judged 1922. Prize for the highest aggregate over the two years.

Name.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Maximum points	**25**	**25**	**25**	**25**	**100**
Murray Bros.	25	25	23	25	98
Worth Bros. No. 1 ..	24	24	24	25	97
Miller Bros.	24	23	23	25	95
Smith Brös.	25	22	25	22	94
C. Reinheimer	23	22	25	24	94
G. W. Hobbs	22	22	25	24	93
E. H. Rudolph	24	23	25	20	92
Worth Bros. No. 2 ..	22	23	21	23	89
Lehmann Bros.	22	22	23	20	87

Farming Systems at Horsham.

In my report of last year the system of farming in the district was dealt with at length. It was stated that the popular tendency in the district was to crop the land very closely to wheat after fallow without a rest or change of crop unless this was forced by an outbreak of take-all. It was pointed out that there was no doubt that the practice was the most immediately profitable, but that it is doubtful whether in the long run it could be continued without increased attacks from disease and lessened yields through humus exhaustion. The present system was certainly justified when pioneering, or as a war measure when the maximum supplies of foodstuffs were required and when prices were high, but it cannot be accepted as the best possible permanent system of agriculture. Where oats are introduced, and particularly where they are specially sown for feeding-off purposes, for live stock, the drain on the soil fertility is lessened, the risk of disease is minimized, and the immediate profit is really little less.

TENANT SYSTEM.

A pernicious tenant system is arising in the Wimmera under which owners are exacting the highest possible rents from tenant farmers. The tenant has no option but to crop the land to wheat in the closest possible way, and there is thus no incentive to maintain the land in a permanently fertile condition. Many leased farms are notorious also for the dilapidated state of the permanent improvements. Owners

demanding high rents must recognise that what they gain in rent they may lose several times over in depreciation of improvements and impoverishment of soil. All covenants between tenant and owner should provide for the maintenance of soil fertility unimpaired. That is to say, they should stipulate the rotation system to be employed.

A 430-ACRE FARM AT HORSHAM.

What Wimmera land will do when well farmed is illustrated in a very definite way by the success of Mr. G. Jenkinson, "Roseleigh," Horsham, whose farm is only 430 acres in area. A regular rotation system is practised, including fallow, wheat, and grass, and 20 to 30 acres of oats are grown each year. Usually 150 acres are sown to wheat, 150 acres are fallowed, 50 acres are in oats, and the balance of 100 acres is in grass. From 50 to 100 sheep are maintained.

Improved Type of Stable (Messrs. Smith Bros., Horsham).

Mr. Jenkinson sows on winter fallowed land, works it well, and sows $1\frac{1}{4}$ bushels of seed with 80 to 90 lbs. of super. He seeds about three weeks after the first rains. He has not averaged under ten bags per acre for the last ten years; his highest yield was fourteen bags to the acre. His comfortable homestead reflects the general prosperity he enjoys.

Summer Fallow at Horsham.

So far the practice of summer fallowing has not made such headway at Horsham. None of the crops entered for competition this year was grown on summer fallowed land except portion of Mr. Reinheimer's. A number of the fallows submitted for competition, however, were summer fallowed. The experience elsewhere in the Wimmera is that summer fallowed land produces heavier crops by one or two bags to the acre, and in this connexion it is worthy of note

that the 160 acres of Federation grown by Messrs. Hobbs and Knuckey at Dooen, which averaged 50 bushels per acre, was grown on summer fallow.

An Effective Stable.

The question of labour saving when feeding, handling, and housing working horses is a perennial one on the wheat farm. Messrs. Smith Bros., of Horsham, have designed and erected a stable which effectively reduces this work to a minimum. The principal points about this stable are that the horses are back to back, and thus can be easily handled by the teamsters, that the central passage way is wide enough to yoke a four-horse team in the stable if necessary, and that the feed can be trucked to each horse without involving carrying or lifting. The stable houses twenty-four horses, and contains two loose boxes. It is 66 feet x 40 feet. The feed alleys at the head of the horses are 4 ft. 6 in. wide, and the stalls are 6 feet deep. They are made 5 feet wide so as to preclude the possibility of the horse attempting to turn round in the stall. There are substantial doors swung on patent roller gear at each end of the stalls. They are each 13 feet wide. The object is to allow of free entry and egress of horses and of air and light. At night the horses are allowed free entry or exit to the stalls as they please.

The chaff-house holds 50 tons of chaff, enough for several months supply. It is placed on the roof of the stable on five 12 x 3 oregon rafters. It is 40 x 20 x 12 feet high. The chaff-house helps to keep the stable cool, and the chaff comes down two large chutes 10 feet square at the widest point, tapering to a nozzle when over the trucks. There is a truck at the head of each group of horses. A photograph of this stable is included.

Messrs. Pope Bros., of Donald, have also adopted the stable of the tail to tail type. Plans and specifications kindly supplied by Messrs. Pope Bros. were printed in this *Journal* for June.

BENALLA FALLOW COMPETITION, 1921.

Report by the Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer, Department of Agriculture.

This competition, the initial effort of the Society in this direction, is the outcome of a local feeling that there is something more to be learned about fallowing methods under the conditions that exist at Benalla. It may seem strange that a district enjoying an annual rainfall of about 26 inches should require to fallow for wheat, but leading farmers who are competent to speak state that not only is fallowing the most convenient method of preparing land for wheat there, but also that the yields obtained are substantially better than those obtained by merely ploughing and sowing. The increase due to the fallow is set

down roughly at 6 bushels per acre. In a few cases a catch crop of millet, or sometimes rape, is taken off the fallow, but the majority prefer the bare fallow.

Obviously it is wasteful to allow the land to remain bare when useful fodder can be grown, but it is yet to be determined whether there is a detrimental influence on the succeeding crop by such a practice. The results of the experiment field at Rutherglen in the North-east (21-in. rainfall) indicate that there are distinct possibilities of growing a forage crop at Benalla without detriment to the wheat, and indeed with benefit, but actual test is required under Benalla conditions.

In the meantime the immediate question for solution is to determine the best method of preparing the bare fallow. Thus, when should the land be ploughed, and how deep? Should it be worked to preserve a mulch, or should it be allowed to lie in the sod for the greater part of the time it is fallow? On this question, if there is any definite guidance, it is to be obtained from the experimental field at Rutherglen. The rainfall is lighter there, but the soils on that farm are not unlike some of those in the vicinity of Benalla. The grey buckshot soils are here referred to, not the red loams.

Results—Cultivation Tests, Rutherglen.

This field has been permanently established since 1912. The results for a number of years are therefore available. July ploughing was found the most effective where the land was subsequently cultivated, but if no cultivation were given it made no difference whether the ploughing was left till October. The July ploughed land, well cultivated, gave 6.4 bushels per acre more than the land unfallowed and just ploughed up before seed time. These figures correspond very well with what farmers find at Benalla.

TABLE.—RESULTS OF SIX YEARS' TESTS, EXPERIMENTAL FARM, RUTHERGLEN.

	Average yield per acre.
Ploughed 5 inches deep at seed time, non-fallow	12 bushels
Ploughed 5 inches deep, October, and not cultivated, fallow	15.6 bushels
Ploughed 5 inches deep, October, and cultivated, fallow	15.8 bushels
Ploughed 5 inches deep, July, and not cultivated, fallow	15.3 bushels
Ploughed 5 inches deep, July, and cultivated, fallow	18.4 bushels

That is to say, if the ploughing is delayed until October no amount of work subsequently will make up for the late ploughing. In the case of July fallow, by cultivation, 3.1 bushels extra per acre were obtained as compared with land ploughed at the same time and left in the sod.

Now, in interpreting these results for Benalla conditions, it must be remembered that the Benalla winter is moister, and consequently it is difficult to plough the land there as early as July. But it is

probable that the earlier the land is ploughed after the winter the better, and that it pays to work it in spring and after heavy rain, provided that the soil does not work down too fine.

The Rutherglen tests furnish very definite evidence indeed on the depth at which land should be ploughed in the north-east. It is well known that shallow ploughing is favoured in the Wimmera and Mallee, but in the north-east the standard depth is about 5 inches. The Rutherglen tests fully justify this depth, and indicate that where the depth of soil permits, even greater depths give better yields.

Results at Rutherglen over six years.

	Average yield per acre.
Ploughed 3 inches deep, July, and cultivated	15.6 bushels
Ploughed 5 inches deep, July, and cultivated	18.0 bushels
Ploughed 7 inches deep, July, and cultivated	19.3 bushels
Ploughed 9 inches deep, July, and cultivated	19.1 bushels

Working Fallows at Benalla.

If, then, we are to accept the Rutherglen figures as any criterion as to what should be done at Benalla for wheat, the land there should be ploughed to a depth of at least 5 inches as early as convenient after the winter. The harrows should then be used as soon as possible. In the spring the land should be worked down with the lightest implement consistent with weed killing and handling the clods, and the surface kept loose to a depth of 3 inches as required. The greatest pains should be taken to work the soil on the moist side, and it should be left in a slightly cloddy condition so as to prevent the surface running together and setting. The use of the disc cultivator is often unavoidable; but where the spring-tooth and harrows can be substituted it is an advantage.

So much for the conclusions that can be drawn from the Rutherglen experiment field, but as time goes on the Benalla Agricultural Society hopes to learn much from the practices of local farmers, some of whom no doubt grow better crops than others.

Results of the Competition.

FALLOW COMPETITION, BENALLA.

For best fallow not less than 30 acres.

Name.	Soil Type.	Moisture.	Mulch.	Weeds.	Cultivation.	Total.
Possible Points	.. .. ..	25	25	25	25	100
F. Hall	Sandy loam	22	18	25	23	88
D. Smith (No. 1)	Clay loam	17	22	25	20	84
Henry Hill	Clay loam	17	20	25	20	82
D. Smith (No. 2)	Clay loam	11	17	25	17	70

Mr. Hall's fallow was on a paddock containing loamy drifts, and is situated near the Broken Creek. It was highest in available moisture of any of those submitted, had been thoroughly cultivated, and was free from weeds. The mulch—disced to the full depth of the plough—appeared to be too deep (about 5 inches). Marks were accordingly heavily deducted, but that notwithstanding, this fallow scored so well in other sections as to win the first place. The reason why such a deep discing is undesirable is the difficulty likely to be experienced in securing a solid seed bed in so short a time before seeding.

The fallow was worked as follows:—Ploughed to 5½ inches in September and October, harrowed twice shortly after, harrowed in December, and disced deeply in January.

Mr. D. Smith's No. 1 entry was second. This fallow was not so high in moisture, and a few points were deducted on the score of uneven cultivation. It was ploughed 5 inches deep in September, then left till February and disced.

An interesting contrast in the value of a mulch in conserving moisture is afforded by Mr. Smith's two entries. One was mulched and the other was merely left in the sod. The mulched paddock contained one-third more moisture than the other.

It is not important, except in dry years, to conserve moisture from the year before for crop requirements in a climate like this, but it is necessary to keep the fallow moist during summer to allow of the process of plant food formation to take place; *e.g.*, soil bacteria do not work in a dry soil, hence little nitrate is prepared for the growing crop.

Mr. Henry Hill's clay loam had a very thin mulch, and the cultivation was rather patchy through the paddock having been allowed to set in patches before it was last harrowed.

Farming at Goorambat and Stewarton.

Mr. D. Smith, of Goorambat, has 560 acres. He cultivates 120 acres of wheat, 30 acres of oats, and has about 120 acres of fallow annually. All wheat is now sown on fallow. The average yield is about 18 bushels. Major wheat, a variety raised by Mr. H. Pye, at Dookie College, is preferred. Three hundred sheep are kept.

The following rotation systems are practised:—Fallow, wheat, oats, fallow, and fallow, wheat, oats, grass, fallow. Mr. Smith works the fallow with a disc in spring, and with a spring-tooth if this implement will do the work before seeding. 70 lbs. of seed are used and 80 lbs. of superphosphate.

Mr. F. Hall has 384 acres—200 acres are cropped, 20 acres are in citrus trees, and there are 4 acres of lucerne. A Nunan spray system has been installed, primarily for the citrus, and is used on the lucerne. The fallow is well worked as a rule. 70 lbs. of seed are used with 100 lbs. of superphosphate. The rotation system is—fallow, wheat, oats, and fallow, wheat, fallow, wheat, grass.

Mr. Henry Hill, Stewarton, has 900 acres. As a rule, 200 acres are sown to wheat, and 70 acres to oats. Half the wheat is sown on fallow. The general practice is to fallow to 5 inches in August, September, and October, work the fallow well, and sow in May with 60 lbs. of wheat and 90 lbs. of superphosphate. Major is the kind of wheat preferred.

Suggested Improvements at Benalla.

From a cursory inspection of the few farms seen, it is not safe to generalize. Further experience in the district may bring to light fresh facts. It is highly probable that Benalla wheat-growers would improve their yields by paying more attention to the following rules in cultivation:—Early harrowing of the fallows after the first ploughing; cultivation of the fallow early after heavy rains before the land dries out; reduction of the use of the disc cultivator, which breaks the land down too fine, especially if worked on dry land; the use of the spring-tooth cultivator for working fallows where possible. This implement leaves the clods on the surface, and sifts the finer earth below.

In sowing, it would probably pay to increase the rate of seeding to 80 to 90 lbs. per acre, and the amount of superphosphate to 1 to 1½ cwt. Harrowing after the crop is up should prove especially beneficial where the soil has set.

The Cultivation of Lucerne.

Several lucerne paddocks were noticed at Benalla, grown entirely on the natural rainfall. Indeed, a good many exist in the north-east, notably at Violet Town, Euroa, Wangaratta, and Rutherglen. In this part of the State, a fair proportion of the rain can be expected in the summer months, hence it is specially favorable to summer crops like lucerne, and there are many thousands of acres in the north-east that could be profitably sown to lucerne.

Lucerne ought to do well at Benalla on any of the deep loamy soils; where these obtain, it would certainly pay to sow it. Lucerne is often difficult to "strike" the first time, but one failure should lead to a second attempt. Fallow the land deeply, work after rains to free it of all weeds; sow in spring in moist weather with Hunter River lucerne at the rate of 10 lbs. per acre. Use 1 cwt. of superphosphate. The seed bed should be fine and firm, and the lucerne sown at or near the surface. Mix the lucerne with the manure and sow through the manure run.

. . . .

In conclusion, I desire to commend the Benalla Society on being the first Agricultural Society in the north-east to commence the Crop and Fallow Competitions. It is to be hoped that the influence will ultimately extend to the Goulburn Valley.

I would also like to thank the Secretary, Mr. Monteath, and other officers of the Society, for their work in connexion with the judging.

WEEDS AND THEIR ERADICATION.

(Continued from page 365.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

The Bracken Fern (*Pteris aquilina*). Order: Polypodiaceæ.

The Ferns of Filicales are members of an extensive group of flowerless plants known as the Cryptogamia, of which the common Bracken, so well-known to most people, is an example. This fern has a world-wide distribution, and in many parts of Victoria takes possession of the ground to such an extent that it crowds out the better vegetation and becomes a most difficult pest to eradicate. Its black creeping rhizomes or root-stocks spread themselves through the ground in every direction and often to a considerable depth. The root-stocks are irregular branching stems, each of which ends in a small pale-

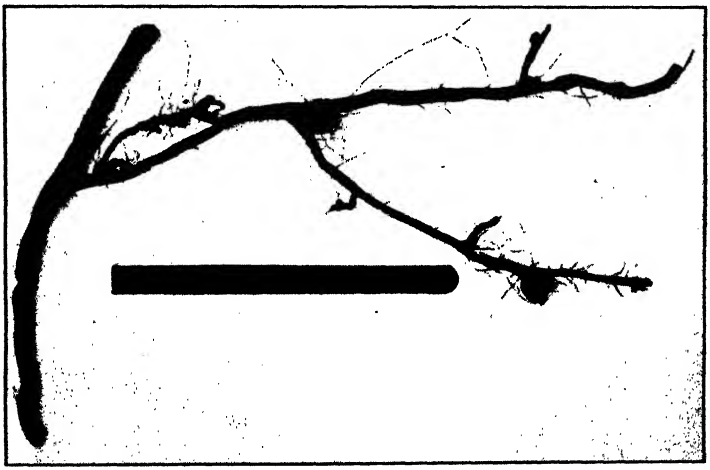


Fig. 42.—Underground Root-stock or Rhizome of Bracken Fern.

coloured growing point or knob from which it further extends itself through the soil. These underground stems creep mostly horizontally beneath the surface of ground (Fig. 42), sending up leaves year after year. Bracken ferns are herbaceous and perennial; the fronds die down, but are continually replaced from the underground root-stocks which cross and recross each other beneath the soil in all directions, often quite filling the surface soil with their masses.

New fronds will arise from the stems (Figs. 43, 44) at intervals, and some will later on produce spores for the further reproduction and dispersal of the species. These fertile fronds are easily recognisable by their characteristic bronze colour, mostly due to the masses of sporangia (spore vessels) clustered thickly on the underside of the leaves. If the underside of one of these leaves be examined during summer or early autumn it will be found to have incurved edges, which

more or less hide the spore-cases from view. As these innumerable spores mature, the reflexed margins of the leaves straighten out and expose the spores to view and liberates them.

Bracken ferns often become a serious pest on hilly forest land that has been cleared of heavy timber, the ferns rapidly taking entire possession of the ground before grasses can be successfully established. Ferns need not be allowed to establish themselves on land that can be cultivated, and even when growths are heavy on this class of land, there is no better method of clearing it than by cultivation, and afterwards raking off and burning the masses of rhizomes exposed by the plough.

Bracken, like most ferns, is intolerant of lime, and applications of the latter after cutting the ferns will assist very materially in their suppression; this at the same time will encourage the growth of clovers and grasses. Anything making for the improvement of the grasses, such as liming and manuring, will help in the eradication of this fern.

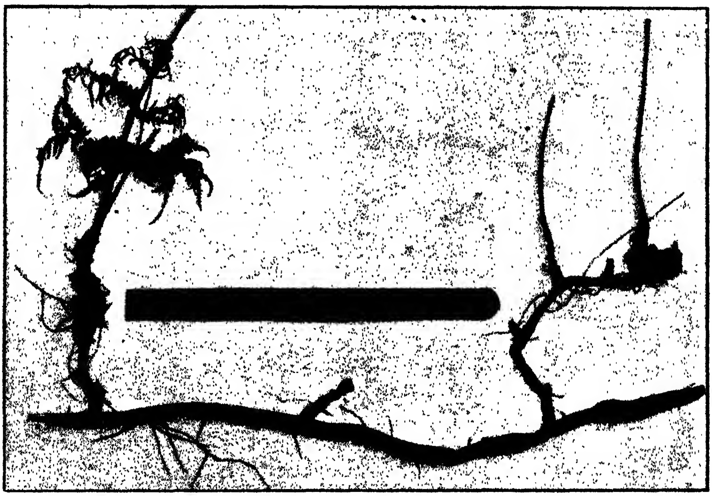


Fig. 43.—Fronds arising from Root-stocks of Bracken Fern.

The usual practice adopted for controlling bracken fern is cutting, but this work is very often carried out irrespective of the condition of the plant. Very few people would wait until such plants as St. John's Wort or Stinkwort were in seed before cutting them down, as this would only tend to scatter the seed, yet in the case of fern cutting this is often done. The best time to make the first cutting of bracken is as soon as the sporangia previously mentioned makes its appearance. The spores are the reproductive organs, and the fern has to draw heavily on its root-stock for their development, so that cutting ferns at this time will not only stop spore production, but also has a very weakening effect on the root-stock. After cutting down the ferns it will not be very long before a second crop of leaves makes their appearance; these should also be cut before any of them have an opportunity to produce spores; such cutting will also give the root-stock a further

weakening. This second and also cuttings during the following season are easier and quicker to do owing to the tenderness of the new fronds.

Some land-owners heavily stock their land after fern cutting, as the young leaves or crosiers arising later are then very soft and brittle, and are easily destroyed by the trampling of stock. In fact, any method of bruising fern stems whether by means of stock or farm implements has a most weakening effect on the root-stocks.

Fig. 44.—Fronds arising from Small Root-stocks of Bracken Fern.

Arsenical preparations have not much effect on bracken unless applied several times. In experiments in destroying St. John's Wort, it was found that the fern could survive applications heavy enough to kill the wort.

Dry salt applications after cutting the ferns gave much better results, and if stock had been available in these tests, the results in all probability would have been even better.

The following extract from *Farmers' Bulletin* No. 687, United States Department of Agriculture, is of interest:—

"Experiments were made in 1912 and 1913 to test the efficacy of spraying as compared with cutting and to learn the best method of obtaining a stand of grass and clover on the fern-infested areas. The spray materials used were solutions of salt, arsenite of soda, and iron sulphate. These materials were used in quantities of equal value. The results of these tests showed the following facts:—Salt is the best spray material of the three. With ferns at an average degree of thickness on the land, 150 pounds of salt dissolved in 60 gallons or more of water to the acre for each application are sufficient. Two sprayings a year are about as effective as four, and are to be recommended. Cutting is somewhat cheaper than spraying. Furthermore, the cutting does not interfere with young clover and grass coming in on the infested patches after the first treatment. This method, therefore, is to be recommended in preference to spraying in most situations. In some places the land is so stony as to interfere with cutting, in which case spraying may be the best method. It was found that scattering seed in the patches where ferns had grown was the most important means of getting a stand of grass and clover, and that liming and fertilizing in addition to the seeding were of considerable benefit."

(To be continued.)

THE VALUE OF CHEESE AS A FOOD.

Dr. Bishop, a well-known New York specialist on diseases of the heart, in a book he has just written, cannot emphasize enough the wonderful power of cheese as an item in the diet of human beings. It is of the utmost importance, he says, in combating diseases of the heart and preventing a subsequent breakdown of the body. What cheese does not contain for the necessary nourishment of the body is supplied by bread, so that a cheese sandwich represents everything required by the human frame to keep it in health and strength.

Professor Sohn, in his book "Nutrition," writes: "One pound of cheese contains as much nourishment as 1½ lb. of lean meat; and 6 oz. of cheese with 24 oz. of bread will supply all the food nutrients required in twenty-four hours by an average grown-up individual."

Although cheese is probably the oldest of the dairy products, and has been a staple food with many races for countless years, the tendency has somehow got about to regard it as suitable for use only in small quantities."

We in Britain make use of cheese much more freely and in much larger quantities than they do in America. Cheese and bread form part of the midday meals of our hardest workers, and they can testify to its powers of nourishment and its ability to build up bone and muscle. During the war our coal supply was seriously threatened by the shortage of cheese, and the miners' ration of that commodity had to be materially increased before the threatened danger was averted.

POTATO EXPERIMENTS, 1921-22.

J. T. Ramsay, Potato Expert.

The results of the experimental work for the past season are presented herewith.

The trials were conducted at Millbrook, Thorpdale, Trentham, and Modella, the soils of the first three being red volcanic, and that of the latter grey swamp loam.

The trials included manure tests, variety tests, immature *versus* ripe seed, and selected *versus* unselected seed.

Selected Seed Test.

The outstanding feature of the trials is the result obtained from selection of seed.

At Millbrook three classes of seed were procured from the crop. These were as follows:—

I. Seed from plants producing a crop of 7 tubers and over.
II. Seed from plants producing 4 to 6 tubers.
III. Seed from plants producing 3 tubers and under.

These three classes of seed were planted under the same conditions and yielded as follows:—

Standard of Seed.	Per cent. of Crop producing 7 and over.	Yield per Acre.
		t. c. q. l.
7 and over	61 %	6 5 0 0
4 to 6	15 %	4 16 0 0
3 and under	7 %	4 5 0 C

Immature v. Ripe Seed Test.

This test was made at Millbrook, with the following result:—

Variety.	Immature Seed.	Ripe Seed.	Increase due to Immature Seed.
	t. c. q.	t. c. q.	t. c. q.
Red Ohio	4 5 0	3 0 0	1 5 0

Variety Tests, Millbrook.

Variety.	t.	c.	qrs.	lbs.
Factor	3	16	1	0
American Wonder	3	0	1	0
Duchess	5	5	1	0
Brown's River	3	0	1	0
Red Ohio	4	5	0	0
Dates	3	5	0	0
Carmen III. Selected	6	5	0	0

Manurial Trials.

I.—MILLBROOK.

Plot.	——	Weight of Row.	Weight per Acre.			
		lbs.	t.	c.	qrs.	lbs.
1	Super., 2½ cwt. per acre ..	376	7	11	0	8
2	Super. and Sulph. Amm., 1 cwt.	325	6	10	2	9
3	Super., 5 cwt.	325	6	10	2	9
4	Market Garden, 2½ cwt. ..	376	7	1	0	8
5	Market Garden, 5 cwt. ..	356	7	3	0	4
6	Basic Super , 5 cwt.	290	5	14	2	26
7	No Manure	290	5	14	2	26

II.—CHILDERS.

Plot.	——	Section Weight.	Weight per Acre.			
		lbs.	t.	c.	qrs.	lbs.
	Limed.					
1	5 cwt. Super. per acre ..	106	7	19	0	0
2	5 cwt. Nitro Super. per acre ..	100	7	10	0	0
3	2 cwt. Sulph. Ammonia ..	63	4	14	2	0
4	5 cwt. Market Garden Manure ..	95	7	2	2	0
5	No Manure	70	5	5	0	0
6	5 cwt. Basic Super.	95	7	2	2	0
7	No Manure	70	5	5	0	0
	Not Limed.					
1	5 cwt. Super. per acre ..	96	7	4	0	0
2	5 cwt. Nitro Super. per acre ..	100	7	10	0	0
3	2 cwt. Sulph. Ammonia ..	53	3	19	2	0
4	5 cwt. Market Garden Manure ..	93	6	19	2	0
5	No Manure	70	5	5	0	0
6	5 cwt. Basic Super.	101	7	11	2	0
7	No Manure	70	5	5	0	0

III.—TRENTHAM.

Plot.	Manure per Acre.	Yield.			Increase.		
		t.	c.	q.	t.	c.	q.
1	2½ cwt. Super.	4	18	0	1	10	0
2	2½ cwt. Super. .. 1 cwt. Amm. Sulph. ..	4	19	0	1	11	0
3	5 cwt. Super.	4	17	0	1	9	0
4	2½ cwt. Market Garden Manure..	4	17	0	1	9	0
5	5 cwt. Market Garden Manure ..	5	7	0	1	19	0
6	5 cwt. Basic Phos.	4	5	0	0	17	0
7	No Manure	3	8	0		Nil	

IV.—MODELLA.

Plot.	Manure per Acre.	Not Limed.						Limed with 10 cwt. per Acre.					
		Cut Seed.			Whole Seed.			Cut Seed.			Whole Seed.		
		t.	c.	qr.	t.	c.	qr.	t.	c.	qr.	t.	c.	qr.
1	5 cwt. Super.	2	14	3	3	2	2	2	11	2	3	2	2
2	5 cwt. Super. .. 1 cwt. Sulph. Amm.	2	14	3	3	2	2	2	11	2	3	2	2
3	5 cwt. Bone and Blood ..	1	12	3	2	19	1	2	0	2	2	11	2
4	2½ cwt. Bone and Blood 2½ cwt. Super. ..	1	12	3	2	6	3	2	0	2	2	19	1
5	1 cwt. Sulph. Amm. ..	2	0	2	2	19	1	2	6	3	2	19	1
6	5 cwt. Super. .. 1 cwt. Sulp. Amm. 1 cwt. Sulp. Potash	2	19	1	3	18	0	2	16	1	4	7	2
7	No Manure	2	0	2	2	19	1	2	3	3	3	8	3
		Duplicate on Heavier Soil.											
8	5 cwt. Super.	2	16	1	3	5	0	3	8	3	3	18	0
9	5 cwt. Super. .. 1 cwt. Sulph. Amm.	2	3	3	4	7	2	3	8	3	4	12	1
10	5 cwt. Bone and Blood ..	2	6	3	3	18	0	2	11	2	3	2	2
11	2½ cwt. Super. .. 2½ cwt. Bone and Blood	2	11	2	3	18	0	2	19	1	3	8	3
12	1 cwt. Sulp. Amm. ..	2	3	3	3	8	3	2	11	2	3	8	3
13	5 cwt. Super. .. 1 cwt. Sulp. Amm. 1 cwt. Sulp. Potash	2	14	3	3	5	0	3	2	2	4	7	2
14	No Manure	2	6		2	19	1	2	3	3	2	19	1

NOTE.—There were 30 per cent. of misses in the cut seed, and 15 per cent. of misses in the whole seed.

CASSE.*

Wine Defects not directly caused by Micro-organisms.

By F. de Castella, Government Viticulturist.

Casse is the generic term given in France to a disorder or rather a group of disorders, occurring in the condition or colour of certain wines on their being exposed to air; disorders differing radically from wine diseases properly so called, which are directly caused by bacteria. Casse, on the other hand, is not characterized by the active presence of micro-organisms; it is due to chemical, as distinguished from biological, action.

The name itself may be literally translated as breakage (*casser,* to break). It indicates the breaking up or decomposition of the colouring matter, or other substances present in the wine, and their precipitation as a cloud or sediment. The French term is convenient, easily pronounced, and generally used in most wine-making countries. It seems, indeed, to have been Anglicised, since Webster defines it as "a disorder of certain wines, in which they lose most of their colour, depositing a reddish-brown sediment."

Condition trouble is not unknown in Australian and other cellars. A wine which is perfectly bright when bottled may sometimes become dull or cloudy after a while, throwing a sediment, so that, unless carefully decanted, it cannot be served in the attractive condition which usually characterizes such French wines as claret, chablis, &c. Casse, in one or other of its forms, is often responsible for this class of trouble.

In a valuable paper contributed by Mr. Leo Buring at the Sydney Congress two years ago, wine diseases of bacterial origin were dealt with, and the great value of pasteurization for their prevention and control was pointed out.

The present occasion seems opportune to deal with wine disorders of another class: viz., those of non-bacterial origin, briefly reviewing the state of œnological knowledge on the subject, and indicating the means by which such troubles can be avoided and combated.

Though the subject is fully dealt with in modern French books on wine,† there is little or no literature dealing with it in English.

It is hoped, therefore, that the present summary may prove of use to practical cellarmen.

Historical.

In the history of casse, the investigation of the mechanism by which it is caused and the evolution of its treatment we have a striking example of the great practical use of scientific research to the wine-maker.

Prior to 1893, though the term "casse" was sometimes used, much confusion existed. Tour, a more or less synonymous term, was often confounded with tourne, pousse, and other bacterial wine diseases. Yet casse must often have given trouble previously. An ancient writer describes‡ how the wine of 1640 vintage was so bad that "we only

* Paper read at the Third Inter-State Wine Congress, Melbourne, June, 1922.

† Roos' "Wine Making in Hot Climates" devotes half-a-dozen pages to Casse, but this useful work was published when the question was being investigated and before the treatment was properly understood.

‡ *Revue de Viticulture,* Vol. XXXIX., p. 415 (March, 1913), a quotation from an old work entitled *L'Usance de Saintonge Entre Mer et Charente,* published in 1701.

drank it to keep us from dying." He mentions how, by a curious coincidence, exactly 100 years previously, "in 1540, the summer was so hot as to spoil the wines, hence it was called the year of the roasted wines." He speaks of them as *vins morfondus* (perished wines), and explains how "I never drank any of these sick wines except with displeasure, and having by nature the advantage of my taste being indifferent as to wine or water, I should a thousand times rather have gone to the fountain were it not that my sixty years would have led me to fear disorder and change in the economy of my health." He further explains that white wine was less sick than *clairet* (red wine), whence he concludes that the first is male and the second female.

Incidentally it will be seen that the well-known French view that moderate use of wine is good for health does not date from yesterday.

The faulty wines of 1540 were undoubtedly affected with casse.

More recent writers deal with condition trouble, but usually in vague and sometimes curious terms; some have even gone near to the solution of the puzzle, for example, Vergnette-Lamotte.

In his book on wine (1868), he devotes a chapter to "tour," describing how affected wines become brown on exposure to air. If the disease is advanced they resemble brown beer rather than wine. The microscope reveals no special characteristics; "if the mycoderm of tour exists, it has not yet been described." He notes that faulty wines are often made from grapes so mouldy that its bad quality is not surprising, and recommends that mouldy grapes be treated as for white wine, and not fermented on the skins.

It was during the nineties of last century that the subject was cleared up. The wines of 1893 vintage in Southern France were very subject to casse. The disorder was discussed at meetings of the Hérault Agricultural Society at Montpellier. Bouffard attributed the trouble to the sudden precipitation of the colouring matter on exposure to air. Others considered it to be caused by micro-organisms. Armand Gautier* inclined to this view, though he admitted that casse is quite different from tourne. He gave an excellent description of the manifestations characterizing the change, noting that it only occurs after the first racking; so long as the wine is not exposed to air it keeps well. He further stated that the trouble is more pronounced in warm autumns when moulds invade the grapes.

Bouffard's investigations are of the greatest interest. At the same society's meeting in March, 1894, he disagreed with Gautier, holding that casse is not caused by bacteria. He recommended pasteurization and the use of sulphurous acid (SO_2). His treatment is fully described in a communication to the French Académie des Sciences of 9th April, 1894, which is the basis of that recommended by later writers.†

It is worthy of note that Bouffard discovered the treatment before the exact nature of the change or the agency causing it were understood.

Gouirand, in a communication to the Académie des Sciences (22nd April, 1895), showed that casse is due to an enzyme or soluble ferment

* *Revue de Viticulture*, 17th March, 1894.

† Independently of, though almost simultaneously with Bouffard, Müller-Thurgau, the well-known Swiss authority on wine, arrived at remarkably similar conclusions concerning casse, which he published in April, 1894, in *Mittheilungen Über Weinbau und Kellerwirtschaft*. He attributes the prevalence, in 1893, of this imperfectly known trouble, to the very hot summer and early ripening grapes, poor in acid. Pasteurization at 60° C. of the clear wine prevents casse, even if the wine be afterwards exposed to air. Of other treatments, he prefers vigorous sulphuring, the wine being pumped into a cask in which sulphur was burnt at the rate of 1.5 grammes per hectoliter. Early treatment is essential.

present in the wine, since named oxydase, which brings about the oxydation and precipitation of the colouring matter of red wine, and changes that of white wine to deep yellow, or even brown in extreme cases.

The enzyme can be precipitated by alcohol; a small proportion added to a normal wine renders it liable to casse. If, however, after such addition, the wine be heated to 80° C., it is no longer thus liable; the enzyme is destroyed by heating. Thus was explained the preventive action of pasteurization previously discovered by Bouffard.

Though Gouirand found the cause of the change, he failed to trace its origin. He notes that red and white wines liable to casse often contain bacteria, and asks if these may not secrete, either in vat or cask, the enzyme responsible for the trouble. He also suggests that it may be produced by yeasts working under faulty conditions, or that it may preexist in grapes ripened under certain conditions. In an article in *La Revue de Viticulture* (10th October, 1896), on the yellowing of white wine, he points out the identity of this change with the browning of red wines, but the source of the enzyme still escapes him.

To Laborde is due the credit* of discovering that the main source of the enzyme is the grey mould fungus, known as *Botrytis cinerea,* the noble-rot of the grape in the vineyards of Sauternes, the Rhine, &c. He showed how culture liquids of this fungus, added to normal wines, induced casse. Heated to 85°, however, they lose this power. Though he considers this fungus to be mainly responsible for the presence of oxydase, he agrees with Martinand that it exists normally in the grape; much of it is eliminated during fermentation, the small proportion remaining playing an important part in the normal ageing of wine.

Thus was the riddle solved and the explanation given of the connexion, noted by older writers, between casse and wet vintages with mouldy grapes.

In the foregoing we have only considered brown, yellow, or enzymic casse due to the presence of oxydase. There are, however, other forms, the causes of which are altogether different. Amongst these the most important is blue or ferric casse, due to the presence of an excess of iron in the wine. Such a wine, on exposure to air, becomes dull and dark, even assuming a bluish tint, as if a little ink had been poured into it. Ink, in fact, it really is, in the shape of iron combined with the tannin of the wine. On exposure to air the colourless ferrous tannate becomes oxydized to blue-black ferric tannate, or ink.

The investigation of blue casse and the evolution of our knowledge concerning it is not marked by such sensational stages as that of the enzymic form.

It was long known that there was some connexion between the presence of iron in the wine and the development of a blackish or bluish tint on its exposure to air, and also that wines low in acid are more liable to such change. The unstable colour of wine made from Jacquez was correctly attributed to high iron content and low acidity.

So long ago as 1846 Batilhat recommended the addition of tartaric acid to wines liable to blue casse, and in 1897 Bouffard advised similar treatment, the exact dose to be determined by preliminary trials on small quantities of the wine. He also recorded the uselessness of pasteurization to prevent this form.

* Communication to French Académie des Sciences of 11th December, 1896.

No doubt in bygone years, when scrupulous care was taken to avoid contact of wine or grapes with metal, blue casse was much less frequent than it is to-day.

THE DIFFERENT FORMS OF CASSE.

In addition to the brown and the blue forms already mentioned, there are other forms, concerning which our knowledge is less definite.

White casse is characterized by a white or opalescent cloud which develops after aeration. Though differing in appearance it is rather closely related to blue casse, being also due to iron in excess.

Bacterial casse is mentioned in most French wine books. There seem to be several different forms of it, some of which resemble brown casse, in that they seem to be of enzymic nature, the enzyme, however, being secreted by bacteria. This group would thus form a connecting link between casse and the ordinary wine diseases caused directly by micro-organisms.

Mousiness.—This abominable development seems to me to be a form of casse, for reasons which will be specified later.

Aldehydic casse.—Normal maturation is often held to be due to traces of oxydase which remain in the wine. Another view is that it is due to the action of aldehydes, of which small quantities are present in wine, especially in old wines.

It may, of course, happen that a wine may not be affected by one form alone; it is quite possible for two or even more forms to exist simultaneously, in which case the diagnosis of the trouble and its treatment may become somewhat complicated.

Brown and blue casse are the best known and most familiar forms. They must now be considered in greater detail, and their treatment explained.

Brown, Yellow, or Oxydasic Casse.

We have seen how brown casse is due to the presence of an enzyme known as oxydase. The symptoms of the disorder are as follows:—

Cellarmen are familiar with certain red wines which, though quite bright before racking, lose their condition on being transferred to another cask, becoming, in bad cases, quite muddy. Such wines are affected by brown casse. In the original cask they are protected from contact with air, and no sediment forms. Aeration takes place on racking, and enables the oxydase to fix the oxygen on part of the colouring matter and tannin, which, becoming insoluble, form a sediment. After a rest of a few weeks the wine may again become clear, but it will be reduced in colour and of a different tint, having changed from the purple-red of a young wine to a more or less tawny red, or, in extreme cases, to a brown sherry colour. Simultaneously with these changes, the flavour and bouquet are modified, as will be seen presently. If a sample be drawn from the cask in its bright condition, before racking, and allowed to remain in a large glass half-full and covered with a card, it will be noticed to become cloudy after a while, the length of time depending on its liability to casse—in other words, to the amount of oxydase it contains. In very bad cases, condition will be lost after a few hours, a metallic-looking film forming on the surface, the wine becoming quite muddy and of a brick-red colour; in less severe cases the wine will merely become cloudy after a time, varying from one to several days.

The amount of colouring matter and tannin precipitated is usually 1 or 2 centigrammes per litre, but it may be much more considerable, especially on prolonged exposure to air. According to Pacottet,* if, after breakage, the wine be further exposed for 36 or 48 hours, the whole of the tannin may be destroyed, even in wine containing up to 2 grammes per litre. Colouring matter is destroyed as well. He attributes the characteristic odour and flavour to oxydation products of these substances.

The microscope can here be used with advantage. If bacteria are absent it is certainly a case of casse and amenable to treatment described below. If bacteria are observed these may be responsible for the trouble. If present in any quantity, pasteurization should be applied.

White wines may also be liable, but casse then manifests itself by an increase instead of a loss of colour. From the original pale-yellow the wine becomes deeper in tone, even passing to brown, and throwing a muddy sediment in extreme cases. In wines of champagne or chablis types, which should be pale in colour, it is often known as "yellow disease."

Colour and condition are not alone affected, the bouquet and flavour of both red and white wines also undergo a change, the wine tastes flat and worn, even to the extent of acquiring a cooked taste, reminding of prunes.

Casse may, in fact, be assimilated to premature old age. In lesser degree the change may only amount to what is known in French as *madérisation,* and which, though essential in a madeira or a brown sherry, is quite out of place in a light delicate wine. This change is akin, if, indeed, not identical with, the development of a *Rancio* or porty character in many sweet wines.

Casse does not affect the alcohol, acids or sugar contained in the wine, hence it is that wines even badly affected are not unsound in the ordinary sense of the word; there is no increase in volatile acidity.

Whether in red wine or white wine, casse is seldom observed during the first few months after vintage; so long as it contains much carbonic acid, this protects the wine from atmospheric oxygen. It is only after exposure to air in racking that the change can take place.

WHAT IS OXYDASE? WHERE DOES IT COME FROM?

The particular enzyme which causes brown casse has been named oxydase, since its function is to fix the oxygen of the air on the colouring matter and tannin of the wine. It is a chemical or soluble ferment as distinguished from organized or living ferments such as we know in yeast or the different wine disease bacteria.

Soluble ferments or enzymes belong to a group of substances common in the vegetable, also in the animal kingdom. We have an example in diastase of malt, which transforms the non-fermentable starch of the barley into maltose, a fermentable sugar. Likewise in myrosin of mustard. Dry mustard lacks the familiar pungent smell which it only acquires when, on mixing with water, the myrosin is enabled to set free the essential oil of mustard. The oxydation of lacquer by laccase is yet another example rather more similar to casse, since it is an oxydation phenomenon, as is also the browning of sliced apples exposed to air. This

* *Vinification*, p. 268.

last is an almost identical change, and is countered by SO_2, so largely used also, in the treatment of wines liable to casse. A noteworthy feature common to soluble ferments is that a very small quantity is capable of bringing about a change or fermentation in a large bulk of the substance it can act upon.

Oxydase, like other enzymes, is a curious substance of complex and rather obscure composition. As it has not been isolated in a state of purity, its exact chemical composition is unknown. It can be precipitated from a wine containing it by adding three times its bulk of 90 per cent. alcohol—a small quantity of the precipitate redissolved in water and added to a normal wine will induce casse.

In common with other oxydizing enzymes, it communicates a blue tint to tincture of guaiacum made milky with water, a property at one time utilized as a test, though with rather unsatisfactory results.

Oxydase seems to be of a somewhat gelatinous nature, and to exist in the wine in a state of more or less semi-solution, hence it is removed, in part at least, by fining and filtration. In carrying out its damaging action (oxydation of colour and tannin) it is itself destroyed; hence it is gradually eliminated with age, but if present in excess, colour, &c., will be severely damaged before its disappearance.

The presence of this queer substance in the wine may originate in several ways. According to most authorities, it is, in small quantity, a normal constituent of all grapes, as also of apples and other fruit. During fermentation most of it is destroyed, only traces remaining in a properly constituted wine. Such very small quantities are usually considered desirable, and even necessary, for the normal maturing of wine, the characteristic changes of which only differ in degree from brown casse. In the latter case, the change is sudden and brutal instead of being slow and gradual and of very slight extent. In port, madeira, and rancio wines, a certain amount of casse seems even beneficial. It is only when too violent, or occurring in a wine from which it should be absent, that it is undesirable.

Bouffard* drew attention to two marked points of difference between casse and normal maturation. 1st, as regards time.—Ageing extends over months or even years, whereas the changes characteristic of casse occur within a few hours, or, at most, a couple of days after aeration. 2nd, the action of heat.—Pasteurization, even at 100° C. (212° F.), which altogether prevents casse, does not interfere with normal maturation.

The true part played by oxydase in normal maturation—whether it is responsible for the whole or only a part of the changes just outlined—is not altogether clear. Aldehydes are capable of causing very similar changes, as will be shown in connexion with aldehydic casse. More particularly in tawny and rancio wines these substances no doubt play a very large part.

The proportion of oxydase present in the grape varies greatly. according to the season, the vine variety, and the soil on which it is grown.

It is undesirably plentiful in seasons when ripening does not take place under normal conditions. In Bordeaux, 1893 was a very hot year, the grapes ripening much earlier than usual. The wines of that vintage were

* *R. Vit.*, XV., p. 373, 6th April, 1901.

very liable to casse. Over-ripe and sun-scorched grapes are thus liable to contain it in excess, a fact which should not be lost sight of when making dry wines in our warmer districts.

Oxydase must be far more plentiful in some grapes than in others. Varieties such as Grenache and Bastardo, the wines from which soon become tawny, probably contain more than those of stable colour.

The influence of soil seems to be considerable. The same variety grown on two different soils may yield wines which vary enormously in their liability to become tawny. Grenache grown on slate or schists undergoes this change at an early age; grown on limestone soil its colour is much more stable.

The most important source of oxydase is, without question, mould on the grapes at vintage time. We have seen how the close connexion between casse and mouldy grapes was realized long before the nature of the change was understood. Ordinary grey mould (*Botrytis cinerea*) produces it in great abundance. Blue mould (*Penicilium glaucum*), curiously enough, does not secrete it, though it gives a very bad taste to the resulting wine.

Mouldy grapes are particularly undesirable for red wine. Many excellent white wines are habitually made from very mouldy grapes; those of Sauternes and the Rhine, for example. The cellar methods peculiar to these districts, an outstanding feature of which is the lavish use of SO_2, inhibiting the action of oxydase. In mouldy vintages it is well to convert red grapes into white wine, and to sulphite rather heavily. It is thus possible to make a wine of paler colour than from sound grapes, if aeration of the must be active. Martinand's method of making white wine from red grapes is based on taking advantage of the oxydase present in fresh grapes, and by energetic aeration, causing it to precipitate the remnant of colour retained in the juice of rapidly pressed red grapes.

Bouffard describes how Martinand's process "often fails with sound grapes; what little oxydase the fruit contains, being oxydized and destroyed before the colouring matter can be eliminated. Excellent white wines (from red grapes) can be made in mouldy vintages: the oxydation of the rosy juice is then easy."

Treatment of Wines Liable to Oxydasic Casse.

Brown casse cannot be cured, though it can be prevented. Once the colour has broken and been precipitated, nothing can be done to restore it. The wine may, it is true, be blended with one rich in colour, but before this can be done with safety any oxydase which remains in it must be destroyed or rendered harmless.

The yellow colour induced in a white wine can be removed, or at least reduced considerably, by treatment with fresh lees of first fermentation, which have the property of fixing a good deal of the yellow pigment. Manceau† recommends 5 to 6 gallons of thick lees from a sound young wine at its first racking, to 200 gallons of the yellow wine, with thorough rousing; after a fortnight's rest, the wine is racked and fined.

Whether the wine be red or white, prevention is the best course. Wines liable to casse, even those containing a good deal of oxydase, can be so treated as to insure protection from undesirable change. They

* *R. Vit.*, XV., p. 372, 6th April, 1901.
† *Œnologie Champenoise-Notes et Documents*, p. 63.

must, above all, be taken in time; the oxydase must be destroyed before it has been able to damage the wine.

Acids hinder the action of oxydase, but only at fairly high doses, so high as to be impracticable, since it requires 1 per cent. of citric or tartaric acid. .2 per cent. of sulphuric acid suffices, but the addition of this acid to wine is out of the question. Sulphurous acid only acts temporarily, but, as will be shown presently, its use in conjunction with aeration is of the greatest value.

Wines which were sulphited at vintage time are less liable to casse than those not so treated. Preliminary maceration and the very heavy sulphiting it entails should greatly reduce liability to casse by direct destruction of much or most of the oxydase present in the grapes. Plastering, likewise, seems to have a preventive action. Pacottet* states that wines containing more than 4 grammes of potassium sulphate per litre (double our legal limit) are seldom liable to casse.

Two distinct methods of treatment are available—both preventive—viz., pasteurization and combined treatment by means of SO_2 and aeration.

Pasteurization, though the less frequent method, certainly seems a most logical one. It is radical and expeditious. Oxydase is destroyed by heat; unfortunately a rather high temperature is necessary. Authorities are not altogether in agreement on the subject. Laborde recommends 70° to 85° C. (158° to 185° F.) for at least a quarter of a minute. According to Pacottet†, 5 minutes at 70° to 80° C. (158° to 176° F.) are required. Other writers are content with less. The temperature required depends on the liability to casse, in other words, on the proportion of oxydase present; but also on the composition of the wine, its acid content, &c.

It is to be regretted that pasteurizers are not so generally used in our cellars as is desirable, nor are they all capable of heating to a sufficiently high temperature. Mr. Buring has filled a want in devising a pasteurizer which meets all requirements. Before pasteurizing it is usually necessary to filter the young wine, and this must be done with due precautions against exposure to air, otherwise colour, &c., would be damaged before the oxydase is rendered innocuous.

AERATION IN PRESENCE OF SO_2.

In this we have what may be termed the standard treatment, the one most often followed; it comprises two distinct stages:—

I. Protection from the action of oxydase.

II. Destruction of oxydase.

Protection is insured so long as the young wine is denied access to air; so long as it retains sufficient carbonic acid it is safe. But young wines must be racked. Fortunately we have a most convenient protective agent in sulphurous acid or SO_2, which is even more hungry for oxygen than the colouring matter, &c., spurred on by oxydase. Provided the wine, when racked, contains a little free SO_2, it will altogether protect

* *Vinification* (1904), p. 269.
† *Revue de Viticulture*, 2nd November, 1905.

the colour and tannin of the wine. The dose varies from 2 to 8 centigrammes* per litre of SO_2, or double those quantities of bisulphite, it is determined by the air test described below.

Destruction of Oxydase.—It was thought at one time that SO_2 destroys oxydase. No doubt it has some action in this direction, but only if present in such quantity as to be quite out of the question. Even at 5 centigrammes per litre it is only a restrainer, and a temporary one at that, owing to its instability and its early disappearance in active form.†

It is the oxygen of the air which is the most effectual destroyer; but this agent can only be safely employed whilst the damaging action of oxydase is inhibited by the temporary presence of small quantities of free SO_2. Oxydase, which acts as a conveyor of oxygen to colour and tannin, is itself destroyed in the process, being oxydized and rendered innocuous. If a wine liable to casse, but protected by a small dose of free SO_2, be aerated, the oxydase is destroyed without colour, &c., suffering. Thus is explained the standard treatment.

The almost gelatinous nature of oxydase, and its more or less imperfect state of solution in the wine, have been referred to, as well as the action of fining and filtration in eliminating it, at least partially. It follows that ordinary cellar manipulations gradually remove it from the wine; but such removal is gradual, it takes time; it is not immediate as in the case of pasteurization, and during the whole of the time over which elimination extends the wine must be protected by free SO_2.

Treatment of casse on these lines must, however, be applied judiciously; after the addition of SO_2, aeration must not be too long delayed, nor must it, on the other hand, be exaggerated.

As already pointed out, it is not the SO_2 which destroys the oxydase, but the oxygen of the air. Hence the wine must be exposed to air soon after the addition of SO_2 and before it has been able to enter into the combined form. To quote Laborde‡:—

"If the presence of SO_2 in the free state is not utilized early enough or completely enough, the wine only receiving a tardy or incomplete aeration, or none at all, the complete cure of the trouble will not be achieved with the minimum dose necessary." He quotes a case reported by Moreau, who introduced into a wine, liable to casse, and protected for three years from contact with air, the heavy dose of 28 cgms. of bisulphite without effecting a cure. On the other hand, the same wine, bisulphited at a dose very near the minimum, which was 12 cgms., and aerated shortly after, always held (its condition); a result which proves conclusively that the contact alone with SO_2 does not suffice to destroy the properties of oxydase."

Nor must aeration be too active. According to the same writer, "Contrary to what might be inferred from the above, excessive aeration after addition of SO_2 may also be a cause of non-success of the treatment.

The destruction of oxydase by air is, in fact, less rapid than the oxydation of SO_2. If follows that if the wine were to receive excessive or too sudden aeration, the SO_2 would disappear too rapidly and there would no longer be

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* In the following pages, wherever the word centigramme (or its abbreviation, cgms.) occurs, it refers to centigrammes per litre, this being the most convenient way of expressing such small proportions as those in which SO_2 is added to wine. In an appendix will be found a table of correspondence with English weights and measures.

† The elimination of free SO_2 takes place in three distinct ways. Part is directly evaporated when the wine is racked. Part is oxydized to sulphuric acid, which, combining with the potassic salts in the wine, remains as sulphate of potassium. The balance enters into combination with aldehydes, sugar, and other constituents of the wine, assuming the form known as combined SO_2, in which it has but little effect on oxydase. Of the two sugars present in wine, SO_2 only enters into combination with dextrose; it does not combine with levulose.

‡ *R. Vit.*, XXIV., 496, 2nd November, 1905—La Casse du Vin et ses Traitements.

equilibrium between its oxydation and that of the oxydase. The result of the treatment would then be equivalent to an insufficient addition of SO_2."

Laborde recommends the addition to the wine of a little more than the minimum dose of SO_2 determined by the air test (see p. 428), so as to allow for oxydation of portion during the manipulations necessary on a large scale; one-quarter or one-third over and above the minimum may thus be safely added.

The following further extracts from the same article are of practical interest:—

"The bisulphite, dissolved in a little water or wine, is placed in the cask into which the wine will be racked, so that receiving (its dose of SO_2) immediately after being aerated, any oxygen absorbed during racking is powerless to cause casse, but is, on the contrary, favorable to the elimination of the oxydase." In mild cases this preliminary aeration often suffices, but when casse is more pronounced, it is necessary to repeat the aeration, after a week or two, by racking with abundant exposure to air. "This second aeration . . . . may also be effected by pumping air into the wine in the cask . . . . the volume of air should be at least equal to the volume of the wine." After . . . . at least a month, the wine should be again tried by the air test. If it no longer shows casse, it may be fined."

Wines very liable to casse long remain cloudy, even after being cured. This cloudiness may be due to two causes: to bacteria of tourne or to the presence of viscous matter or dextrane, produced by the botrytis fungus. It is this dextrane, more particularly, which prevents fining from being effective, even after addition of tannin. . . . If the wine is not affected with tourne, a long rest will always bring about the settling down of the slimy matter, with complete clarification, but it may be necessary to wait six months or a year. The only means of obtaining more rapid clearing is by filtering with the aid of infusorial earth to coat the filter bags, this being the only material which renders filtration possible in cases where dextrane is abundant, and where, in consequence, the clogging of the bags occurs with extreme rapidity."

Infusorial earth does not seem to be employed to any extent for filtering in Australian cellars. It lends itself more particularly to use in bag filters (as opposed to cellulose or wood pulp filters). Its addition to the finings, used for coating the filter bags, seems to have been first suggested by Laborde* in 1904.

Infusorial, or more correctly, diatomaceous earth, consists almost exclusively of the siliceous skeletons of diatoms (microscopic vegetables); these are elongated, hollow, and angular, being very light they settle gradually, forming a felt-like sediment, which constitutes an excellent filtering medium, capable of stopping, not only very fine particles, but also substances in semi-solution, such as partially coagulated albuminous matter, &c.

If used alone, it has a tendency to detach itself from the bag-tissue, unless used for wine containing a mucilaginous cloud; hence, it needs the addition of a little gelatine or some similar fining. Semichon† recommends, per square yard of filtering surface, about one-seventh ounce of infusorial earth and 10 grains of gelatine (per square metre, 5 grammes infusorial earth, and .75 grammes gelatine). These substances are thoroughly mixed in the wine with which the filter is first filled.

Laborde‡ prefers white of egg or casein as a fixer. He recommends making a dry mixture of eight parts infusorial earth with one part each of soluble casein and tannin in very fine powder. This mixture, made into a smooth paste at the rate of nearly ⅓ ounce per square yard of filter surface (10 grammes per square metre), gave excellent results. At the fourth hogshead, the filter allowed the passage of five times as much wine as a similar filter coated with gelatine alone; in both cases the filtering surface was 2 square yards.

THE AIR TEST.

Before treating suspect wines, it is essential to ascertain their degree of liability; in other words, the minimum dose of SO_2 required for

* *R. Vit.*, XXI., p. 125, 4th February, 1904.
† *R. Vit.*, XXIII., p. 173, 16th February, 1905.
‡ *R. Vit.*, XXIII., p. 568, May, 1905.

adequate protection. It would be foolish to use 6 centigrammes where 2 would suffice. Young wines, made from grapes showing even traces of mould, or which, for any other reason, may be suspected of liability to casse, should be always tested before the winter racking, whether this be the first or second to which they will be subjected.

The simplest test consists in drawing a small sample from the cask and leaving it in a glass, half full, for a few days, covered with a card to keep out dust and insects. If after a couple of days the wine is still clear, no treatment is necessary. If the wine clouds and discolours, treatment must be adjusted to the intensity of the trouble.

Certain precautions should be observed, without which the indications afforded by the test are apt to be misleading. Young wines which have not quite finished fermenting will be protected by the carbonic acid they contain. If fermentation be at all audible at the bung-hole, testing should be postponed until it has entirely ceased. Wines containing much CO_2 can be easily aerated with a bicycle pump to which a rubber tube is fitted; a few strokes will drive off the CO_2 and insure the reliability of the test.

Semichon* recommends the use of several bottles in which are placed different doses of SO_2 (in the form of bisulphite) at the rate of 2, 3, 4, 5, and 6 centigrammes of SO_2 per litre. The bottles are completely filled and corked. After a couple of days' rest, to give the SO_2 time to act, the wines are exposed to air by half-emptying them and closing the mouth with a plug of cotton wool. If the wine with 3 centigrammes clouds slightly, whereas that with 4 remains clear, 4 centigrammes per litre is the minimum dose required.

*Laborde recommends an air test slightly different from Semichon's. Samples are drawn in the same way, and to them are added increasing doses of bisulphite—1, 2, 3, &c., centigrammes of SO_2. Instead of waiting two days before aerating, however, the samples are at once exposed in shallow depth (half-an-inch or so) in flat-bottomed flasks. After 48 hours they are examined and the minimum dose of SO_2 noted.

A simple way of measuring such minute quantities is to make a 1 per cent. solution of bisulphite in water. Each cubic centimetre will then contain 1 centigramme of bisulphite, or half that quantity of SO_2. Pipettes are obtainable, graduated in tenths of a cubic centimetre. A 1 per cent. solution contains 4.375 grains, say 4½ grains per fluid ounce (av.). An ordinary wine bottle, or reputed quart, holds ⅙ gallon, or 26⅔ fluid ounces, or 757¾ c.c. A litre contains 1,000 c.c. If ordinary wine bottles are used, allowance must be made accordingly. The bisulphite solution must be quite fresh; it quickly loses its strength.

Weinmann recommends a direct test, without addition of SO_2, the liability to casse being gauged by the rapidity with which the colour changes. Two clear glass bottles are used, one filled completely and tightly corked as a control, the other half-full and closed with a plug of cotton wool or a piece of clean rag placed over it. If after four or five days the half-filled bottle remains clear, the wine is not liable to change. He divides liability to casse into 5 degrees or categories, as follows:—

1st Degree.—Wine becomes somewhat dull after four or five days' exposure.

2nd Degree.—Dull after one day's exposure, and cloudy after two or three days.

3rd Degree.—Dull after a few hours and cloudy after a day, the cloudiness increasing on the second and third days.

* *Traité des Maladies du Vin*, by L. Semichon, Director of the Œnological Station of Aude (France), 1905, p. 85.

4th Degree.—Formation of brownish-red iridescent film after a day's exposure, the wine becoming cloudy and of a brick-red colour.
5th Degree.—Colour changes after a few hours from reddish-brown to chocolate, the wine becoming very cloudy.

The treatment he recommends is as follows:—

1st and 2nd Degrees.—10 centigrammes per litre potash bisulphite.
3rd Degree (the most usual case).—12½ centigrammes bisulphite, 10 centigrammes citric acid, 5 centigrammes special tannin.
4th Degree.—12½ centigrammes bisulphite, 20 centigrammes citric acid, 8 centigrammes special tannin.
5th Degree.—15 centigrammes bisulphite, 30 centigrammes citric acid, 10 centigrammes special tannin.

Practical Points

depend, necessarily, on the method of treatment to be applied. Two distinct cases must be considered.

I. *Pasteurization is Decided on.*—Though heating to 75° C. (167° F). usually suffices, it is better to experimentally ascertain the exact temperature required. The practical test suggested by Bouffard* is as follows:—Take five strong "baby" bottles (reputed half-pint), fill with the wine drawn direct from the cask, allowing enough room for expansion on heating, cork tightly and tie the corks securely. Through the cork of one of the bottles adapt an ordinary retort thermometer. Immerse the five bottles to within half-an-inch of the top of the corks, in a water bath and heat gradually. Withdraw the bottles progressively when the thermometer has, for half-a-minute, registered respectively 158°, 167°, 176°, and 185° Fahrenheit (equivalent to 70°, 75°, 80° and 85° Centigrade), marking each bottle accordingly. When cold, expose to air in a shallow depth, or even in an ordinary wine-glass covered with a card. The sample which no longer breaks on exposure, has been heated to a sufficient temperature. It is needless to pasteurize at a higher degree. If cloudy, the wine should be filtered before exposure to air (not before heating), an ordinary glass funnel with filter paper is all that is required.

Before pasteurization, the wine, if cloudy, should be filtered, with due protection against aeration during the process. Some authorities recommend to add a small dose of SO_2 before pasteurizing, thus combining the two methods; in this way, a lower temperature and a smaller dose of SO_2 will suffice than if either treatment were applied alone.

Pasteurization is especially appropriate if, as is sometimes the case, the wine shows symptoms of tourne or other bacterial trouble, in addition to casse.

II. *The Wine is to be Treated by SO_2, &c.*—The minimum dose of SO_2 being determined by one of the methods described above, the bisulphite containing it (twice as much as the dose of SO_2), must be dissolved in the wine before exposure to air—in other words, *before* racking. Laborde's advice to use a little more than the minimum dose (see p. 428), can be followed with advantage. One-fifth or one-quarter additional is an ample allowance.

Let us take as an example a 500-gallon cask of wine to be treated, proved by the air test to need a minimum dose of 3 centigrammes SO_2,

* *R. Vit.*, XV., p. 433, 20th April, 1901.

this would mean .96 ozs. of bisulphite per 100 gallons, or 4.8 ozs. for the whole cask. Allowing one-quarter additional, this would be increased to 6 ozs. for the 500-gallon cask. If the wine has already been racked,* and has little or no lees, the bisulphite, dissolved in a small quantity of water or wine, may be poured in through the bung-hole, with gentle rousing to distribute it through the bulk. If, however, the wine has not yet been racked at all, this course could not be followed without disturbing the lees. Under such circumstances, the most convenient way is by hanging the bisulphite, contained in a narrow muslin bag which can fit through the bung-hole, just below the surface of the wine. The bisulphite soon dissolves; after about a week, rack the cask with abundant exposure to air. A further racking a few weeks later is to be recommended. It may be replaced by aeration with the cellar pump (see p. 427), or better, with a motor tyre air pump, or even a bicycle pump. Fining or filtration may be applied a month later if the air test no longer shows liability to casse, though it is usually well to postpone it for a longer time.

Mathieu† does not favour the application of the bisulphite by the muslin-bag method. He holds that the solution sinks to the lees and does not diffuse properly through the wine. It is, nevertheless, recommended by such authorities as Bouffard, Semichon, &c. Tying the bag to a stick and moving it slowly round just beneath the surface until dissolved would insure better distribution.

Mathieu prefers placing the bisulphite (*dissolved* in a little water) in the cask into which the wine will be pumped, *racking being carried out without exposure to air.* This can be done by coupling the suction of the pump directly to the tap of the cask to be racked, the nozzle of the delivery being fitted with a piece of rubber, or even canvas hose, long enough to reach to the bottom of the cask to be filled. Without such an arrangement the wine, falling from top to bottom of the cask, would absorb a good deal of air.

Even when pumping from a tub, as may be necessary if the suction cannot be coupled to the tap, aeration can be much reduced, if not altogether avoided, by the simple expedient of fitting to the tap a piece of hose reaching the bottom of the tub. If the pump be carefully operated so as to avoid sucking air, the tub being always about half full, and splashing and froth be avoided, there will be but slight exposure to air. Here, also, the delivery must dip to the bottom of the cask to be filled. In this case, it will be well to add the bisulphite to the wine in the tub, preferably in occasional small lots.

We have seen (p. 427) that Laborde does not fear aeration *provided the wine receives, immediately afterwards, the necessary dose of SO_2.* Unless the wine be exceedingly liable to casse, these means of minimizing aeration will suffice.

Wines cured of liability to casse are often difficult to handle; their mucilaginous nature and the trouble in fining and filtering has been pointed out (p. 427). This usually corrects itself after a rest of some months or a year. They are also rather prone to colour instability, a defect of less gravity with our dark, full-bodied wines than with the

* A wine which is even fairly liable to casse may escape trouble at the first racking if this be early, owing to the protection from air afforded by abundant CO_2.

† *R. Vit.*, XLV., p. 320, 16th November, 1916.

lighter-coloured wines of France, yet certainly worth noting. According to Laborde*:—

Notwithstanding the destruction of oxydase . . . . which converts the faulty wine into a normal one, its colour retains a greater sensitiveness to air than that of a wine which has always been sound. . . . In the former, sedimentation or precipitation of tannoids is always more rapid than in the latter, even after bottling. This may be explained by Duclaux's theory of coagulation of substances which have aged prematurely. Perhaps, also, aldehydation may play a large part.

Similar changes are observed in connexion with attempted artificial maturation by heat in contact with air, or by hydrogen peroxyde. The ageing of the colour, which at first seems satisfactory, usually has a deferred and too pronounced action. After a few years, wines thus treated are altogether too much worn.

To delay the decolouration of wines cured of casse, it is well to add SO_2 in small quantities, but fairly frequently, whilst they are in hogsheads, and finally before bottling. An addition of tartaric acid also helps to fix colour by releasing it from potassic combination, which is more prevalent than usual, owing to portion of the tartaric acid of the grape being burnt up by the botrytis fungus.

Appendix.

Table Showing the Correspondence of Some Metric and English Weights and Measures.

In the foregoing pages, quantities of SO_2 have been expressed in centigrammes per litre, this being the most concise and convenient way. In order to permit rapid conversion to English standards, the following table has been compiled.

It may first be explained that centigrammes per litre are identical with parts per 100,000. They are likewise identical with grammes per hectolitre.

Centigrammes per litre = parts per 100,000.	Grains per gallon.	Ounces (avoirdupois) per 100 gallons.
1	·7	·16
2	1·4	·32
3	2·1	·48
4	2·8	·64
5	3.5	·8
6	4·2	·96
7	4·9	1·12
8	5·6	1·28
9	6·3	1·44
10	7·0	1·6

It should be remembered that fresh bisulphite of potash contains practically half its weight of SO_2. It follows that 5 centigrammes per litre of SO_2 are equivalent to .8 ozs. of SO_2 per 100 gallons, or to 1.6 ozs. of bisulphite of potash per 100 gallons.

Bisulphite soon loses SO_2 on keeping—after some months' storage the loss may be considerable, especially if it be not kept in air-tight tins or bottles.

(To be continued.)

* *R. Vit.*, XXXII., p. 710, 23rd December, 1909.

WORLD'S POULTRY CONGRESS.

By A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

(Continued from page 310.)

Hygiene and Diseases.

Prof. Dr. J. Poels recommended that State control be adopted, and delegated to veterinary inspectors, particularly with regard to the following:—

Tuberculosis.
Klein Disease (typhoid) and White Diarrhœa.
Cholera.
Pestis gallinarum.
Diphtheritis.
Coccidiosis.

As regards export of birds, he recommended that the Government of each country should take measures to prevent the export of sick, or suspected poultry; and that poultry originating from countries which refuse to comply with this request be not allowed to be imported into other countries. No poultry to be exported without previous inspection, and the Government to issue a certificate of health.

Authority is also necessary to prohibit the import and transit of poultry originating from a country or part of a country where an infectious poultry disease prevails.

It would seem from the foregoing that Australian methods are far in advance of the Old World methods, because not only the Inter-State inspection exists, but also various areas of a State may be quarantined for any particular trouble, such as roup, diphtheritic roup, chicken cholera, tick, and tick fever.

Dr. J. R. Beach, of the University of California, drew attention to the close relationship between some of the poultry ailments, and suggested the following classification:—

Chicken pox, or contagious epithelioma, manifested by the formation of small wart-like tumours on the comb, wattles, or skin of the head.

Canker, or avian diphtheria, is manifested by the formation of masses of adherent cheesy exudate on the mucous membrane of the mouth or eyes.

Colds and roup are manifested by a viscid discharge from one or both nostrils, which has a tendency to collect in the nasal sinuses, where it undergoes rapid transformation into a cheesy mass, causing marked swelling of the face beneath the eyes.

The sole etiological factor of chicken pox is generally accepted to be a filterable virus; but in regard to canker this point is not so definitely settled. In no case has any one species of organism been isolated which could unquestionably be demonstrated to be the special causative factor. A close relationship between chicken pox and canker or avian diptheria has often been noted. In 1913, Hadley and Beach reported success in immunizing fowls against chicken pox by injecting under the skin a suspension in sterile salt solution of scraping from lesions on the

comb and mucous membrane of diseased birds; and, in 1920, vaccine for 300,000 birds was furnished by the California station.

Avian Tuberculosis has been noted in the United States since 1896, and is difficult to diagnose in the living animal except in an advanced stage; negative results were obtained from the sub-cutaneous test with tuberculin from the human variety of organism, and no better results were obtained from avian tuberculin. In 1913, Van Es and Schalk obtained good results from an extradermal tuberculin test for chickens. This test was made by injecting one-twentieth of a cubic centimetre of a 50 per cent. solution of concentrated tuberculin prepared from the avian variety preferably into the wattle. The injection was made as near the surface of the skin as possible. A reaction was noted by a swelling of the wattle in which the injection was made, and this usually occurred most pronouncedly 48 hours after injection. Comparative tests with avian and bovine tuberculosis showed the former to be more reliable.

Fowl Typhoid, or Infectious Leukemia.—This was first studied by Moore in 1895, who isolated the organism, *B. sanguinarium,* and the disease produced was called Infectious Leukemia. The name was selected because an increase of white blood corpuscles and a decrease of red corpuscles had been regularly observed, and the disease is now known on both the Atlantic and Pacific coasts. In 1914, Smith and Tentweek reported a comparative study of the fowl typhoid bacterium and the bacillus of typhoid in man. They found that, although these two organisms have many features in common, particularly their action on carbohydrates and their agglutination affinities, they differed in some essential features, and were therefore distinct.

Hadley considers *B. sanguinarium* (Moore) to be identical with an organism earlier isolated by Klein, and named by him *B. gallinarium,* and therefore prefers to use this name instead of *Bact. sanguinarium* (Moore).

Fowl Cholera.—This was first reported by Salmon in 1880. Although satisfactory methods for bacteriological examinations were undeveloped at that time, there is little doubt that the disease was identical with fowl cholera. His experiments at the time showed that the virus could be cultivated and the disease transmitted by inoculation, or by the confinement of healthy birds on ground previously occupied by diseased fowls.

Fowls recovering from a mild attack of the disease were observed to be insusceptible to subsequent infection. Inoculation with minute amounts of virus produced only a local reaction, from which they soon recovered. Such fowls were found to be insusceptible to subsequent inoculation with larger amounts of virus. It was therefore concluded that fowls could be immunized against fowl cholera by vaccinating them with minute quantities of virus. No definite method of preparing such a vaccine, however, was developed. In 1902 an outbreak occurred amongst geese in Rhode Island, cultures of this organism proving fatal to geese, ducks, rabbits, and pigeons, but not to chickens. The disease died out soon after the institution of sanitary control measures, which consisted principally of dividing the geese into small units, and removing the healthy birds to new ground.

In 1904, Ward reported investigation of an outbreak in California, which was successfully controlled by the employment of sanitary measures, and by replacing the drinking water with a 1-2000 solution

of mercuric chloride. Later, in 1910, Hadley gave daily subcutaneous injections of 5 per cent. solution of carbolic acid with success.

Bacillary White Diarrhœa of Chickens.—In 1899, Rettger, of Yale University, and in 1907, Rettger and Harvey, isolated the causative organism, said to belong to the colon-typhoid hog cholera group, and the following year it was confirmed that the source of infection was the hen that laid the egg. The organism was called *Bact. pullorum.* It was isolated from the yolks of hatching eggs, and the ovaries of hens. In 1911, it was found that infection from chick to chick was non-communicable after they are three or four days old. The female chicks which survive often harbor the infection, and become bacillus carriers. Further investigations in 1919 left the conclusion probable that the male bird in the breeding pen might transmit the infection.

"KEEL" OF DUCKLINGS.

In 1918, Rettger investigated a fatal disease amongst young ducklings, commonly known as Keel, and resembling bacillary white diarrhœa of chickens. The causative organism was called *B. anatum, N.S.* This organism has been isolated in pure culture from ovarian and abdominal cysts of breeding ducks. It is quite probable therefore that the disease is transmitted by breeders through infected eggs, in the same manner as bacillary white diarrhœa.

BLACKHEAD, ENTERO-HEPATITIS, OR TYPHILITIS OF TURKEYS.

This was first studied by Smith in 1894, who ascribed the cause of the disease to a protozon, Amœba meleagridis, which was found in the walls of the cæca and in lesions of the liver. Smith classified it as an Amœba because it resembled that species of protozon more than any other. Cole and Hadley claimed that blackhead was caused by coccidia, and that the Amœba of Smith was merely one stage of the life cycle of the coccidium. Further investigation by Smith in 1915 refuted the coccidial theory, and confirmed his original observation regarding Amœba meleagridis. His experiments also showed that the infection is either not transmitted at all, or only under exceptional circumstances by turkeys in the early acute stage of the disease, but is readily transmitted by exposure to infected ground, or by older birds from infected flocks.

Whilst the disease has been given a vast amount of study, comparatively little concerning practical methods for its control has been brought out, but some success has been met with by feeding a restricted grain ration with an abundance of sour milk, particularly in the case of turkeys raised in confinement.

COCCIDIOSIS OR COCCIDIAL ENTERITIS OF CHICKS.

Meyer and Crocker, in 1913, found that simple isolation, cleaning, and disinfection were the most dependable methods of treatment, and Dr. Poels found that (as in case of blackhead) sour milk was the best system of feeding.

BOTULISM IN POULTRY.

It has been proved that "limber neck" may be produced by the toxin of *bacillus botulinus.* The term limber neck refers only to the

phase of trouble manifested by paralysis of the neck muscles, and prostration. It was reported in 1921 that forty-two outbreaks had been recognised in California during the last twenty years—643 birds out of a flock of 800 died in four days.

All outbreaks reported were traced to the feeding of kitchen refuse consisting of spoiled canned vegetables, and in consequence botulinus antitoxin was administered to all persons who have partaken of the suspected food.

FAVUS.

The causative agent was found by Beach and Halpin to be the fungus *Achorion Schonleinii.* Favus is primarily a wound infection disease of the unfeathered parts of the head, and cannot be transmitted by feeding or intravenous inoculation with the fungus. Ointment made up of formalin and vaseline was found to be preferable to lysol, tincture of iodine, &c.

PARASITIC INFESTATIONS.

Lice.—Bishopp and Wood found, in 1917, that sodium fluoride was the best destroying agent; used as a powder, one application has been found to completely destroy all lice present.

INTESTINAL ROUND WORM—*Ascaris inflexa* (*Heterakis perspicillum*).

Tests were made by Herms and Poels with powdered areca nut, powdered pomegranate root bark, turpentine, gasolene, iron sulphate, and tobacco—the most effective was found to be tobacco. Finely chopped tobacco stems were steeped in water for two hours, and the liquid mixed with the mash and fed to birds that had been starved for 24 hours previously. This was followed by a solution of epsom salts. The worm eggs in the soil of the poultry-yard were destroyed by a 1-1000 solution of bichloride of mercury.

Later experiments in 1919 and 1920 were made with finely ground tobacco, or tobacco dust, which was mixed in the mash at the rate of 2 per cent., and fed daily for three or four weeks. This amount of tobacco was found to have no ill effect on the egg production of the laying hens, nor to retard the growth of young stock.

Horton, in 1916, reported success by the use of either oil of chenopodium, or the plant (*chenopodium anthelminticum*) from which this oil is derived. The plant was fed green, or else chopped up and mixed with the mash. Another method was to make an extract of the plant by soaking it in gasoline for three or four days, and then add the gasolene to the mash, using about 4 c.c. for *each* bird. The oil itself, when used, was added to the mash at the rate of 4 c.c. for 12 birds. (This oil is extensively used for the eradication of round worms in young puppies.)

TAPE WORMS.

It was not until 1916 that Gutberlet demonstrated that the cystoceroid stage of the tape-worm (*Choanotænia infundibuliformis*) occurs in the common house fly (*Musca domestica*). Flies fed on eggs of the tape-worm were said to develop cystoceroids, and in turn chicks fed on these flies developed the worm; but experiments with two other tape-worms

(*Davainea cesticillus* and *Davainea tetragona*) gave negative results. Further experiments in 1919 revealed the fact that another tape-worm (*Hymenolepis carioca*) may be transmitted to chickens by the stable fly (*Stomoxys calcitrans*).

This knowledge regarding the mode of transmission should contribute towards effective means of controlling the trouble.

Gape-Worm (*Syngamus trachealis*).

Experiments in 1920 by Waite show that these parasites are transmitted by earth-worms. Chickens and fowls fed on worms from infected yards became infected, but the parasites were not transmitted to healthy chickens by feeding gape-worms, nor by confining them with infested chickens. The important feature of control is to prevent chicks from obtaining earth-worms from contaminated soil.

Leg Weakness in Chickens.

Until recently, it has been concluded that this is due to lack of exercise, over-feeding, or the absence of green feed. In 1918, Osborn and Mendel were successful in rearing a number of affected chickens, after roughage, in the form of paper pulp, was added to the ration.

Feeds rich in vitamines, such as butter, fat, yeast, green cabbage, green clover, and orange juice, did not, in the absence of roughage, prevent the development of leg weakness. Plenty of exercise and green feed also failed in the absence of the roughage, which was found most suitable in the form of paper pulp.

(To be continued.)

A CHEAP PEN FOR SINGLE TESTING HENS.

By W. C. Rugg, Poultry Foreman, Werribee State Farm.

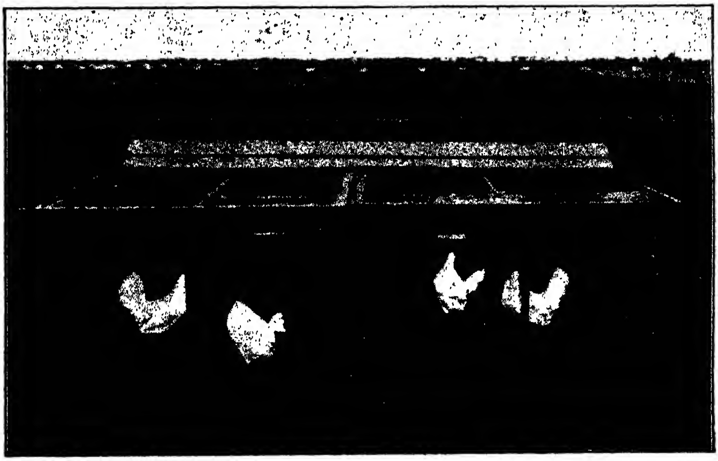
To lay the foundation of a profitable flock of birds for egg production, it is necessary to determine accurately the individual capability of each bird to be used in the breeding pen. For this purpose, trap-nests of various kinds have been used more or less successfully, but the single pen system is undoubtedly much superior.

To many poultry breeders the drawback to this system has been the high cost of erecting the required number of pens. In order to overcome this difficulty I have designed a coop, which, I feel sure, will appeal to every poultry breeder for its usefulness, simplicity and low cost of construction.

As will be seen by the illustration, it consists of a coop for the single penning of 4 birds; it is 8 feet long, 2 ft. 10 in. wide, 3 feet high in front and 2 ft. 6 in. at the back, and is partitioned off into four divisions, each 2 feet wide.

Running out from these partitions is a set of five hurdles 6 feet long and 2 ft. 6 in. above the ground with another hurdle 8 feet long and 2 ft. 6 in. above the ground across the front to complete the enclosure; the whole is covered with a wire netting frame, to insure each bird remaining in its own compartment, and each compartment contains 6 square feet under cover and 12 square feet in the yard. Thus, each bird has ·18 square feet, which is equal to the space allowed in the single pens used in the Burnley competition and at the Research Farm, Werribee.

The hurdles forming the yards are held in position by hoop iron sockets attached to the coop into which the projecting ends of the rails are inserted, and the corners of the yards are held securely by loops of wire through which a wire pin is passed. The size of the coop has been limited to accommodate 4 birds, so that with very little time and labour it may be detached and re-erected on fresh ground.



Front View of Pen.

Material required for a coop to single test 4 birds:

88 ft. 3 in. of 2 x 1 hardwood.
42 feet of weatherboard.
65 feet of 16-gauge wire.
3 square yards wire netting.
4 ft. 8 in. of 1 in. hoop iron.
2 pairs of small hinges.
50 square feet of ruberoid, 2-ply.
4 kerosene tins for nests.

Material required for the hurdles:—

150 feet of 2 x 1 hardwood.
36 yards of wire netting 3 feet wide.
1 kerosene tin to cut 4 feed troughs.

METHOD OF CONSTRUCTION.

Cut up the 2 x 1 hardwood as follows:—

2	pieces	9 feet long.
3	,,	8 feet ,,
2	,,	2 ft. 11 in.
3	,,	3 feet.
2	,,	2 ft. 5 in.
3	,,	2 ft. 6 in.
5	,,	2 ft. 8½ in.
2	,,	2 ft. 7½ in.

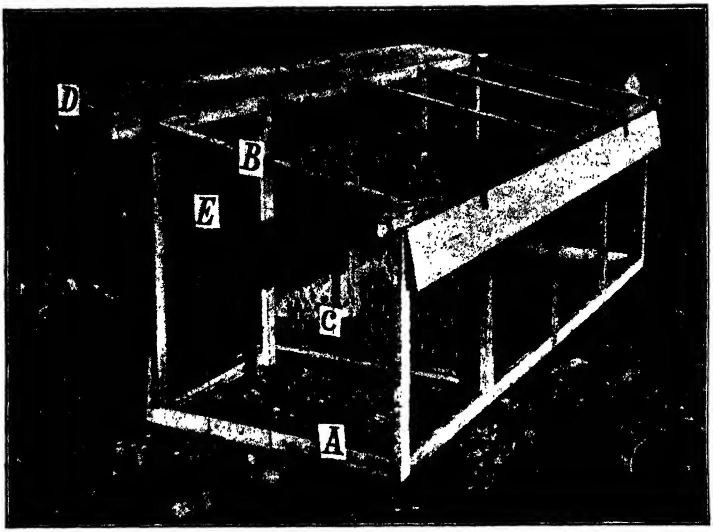
Side View of Pen.

Then cut the weatherboard into 4 pieces 8 feet long, and 3 pieces 2 ft. 8½ in.

To make the front of the coop, lay out one of the 9 feet lengths of 2 x 1, and one of the 8 feet pieces, 2 ft. 8 in. apart; nail a 2 ft. 11 in.

piece at each end of the 8 feet piece, and to the 9 feet piece 6 inches from the end and one inch from the top edge; next lay the 3 pieces of 3 feet at equal distances between these two and nail them on; turn this frame over and nail on a piece of 8 feet weatherboard just above the bottom batten; this completes the front frame of the coop.

To make the back, lay down 2 8-feet lengths 1 ft. 7½ in. apart, then lay a piece of 2 ft. 5 in. at each end, and the 3 pieces of 2 ft 6 in. at equal distances between the first two, mark them and scarf out the pieces to make a flush joint to which to nail the ruberoid. The 9 feet batten is to be nailed at the top of these short pieces, allowing 6 inches to project at each end; to it hinge an 8-foot piece of weatherboard to complete the back frame of the coop. This weatherboard is used as a ventilator board in hot weather.



Showing how Back Portion may be Constructed.

Now stand these two frames up and join together at the bottom with one of the 2 ft. 7½ in. pieces, A, at each end; then nail on the 5 pieces of 2 ft. 8½ in., B, to carry the roof, keeping them flush with the top rails of the frames; then take the 3 pieces of weatherboard 2 ft. 8½ in. long, C, and nail on to make the bottoms of the three partitions; complete these 3 partitions with wire netting. Next, take the two remaining pieces of weatherboard, D, join together by nailing on 3 cleats, and hinge on to the top of the front of the coop; this will rest on the hurdles of the yards and act as a verandah to prevent rain beating in on the birds; it is also convenient to lift up to enable the attendant to gather the eggs, to fill the water pot, and to catch the birds if necessary. The 6-inch pieces of batten projecting at each end of the coop are used as hand holds when it is desired to move the coop.

Next take the 16-gauge wire, E, and put up 3 rows at each end and the full length of the roof, about 8 inches apart, and 2 rows along the back at equal distances apart; these wires are to support the ruberoid and to prevent it sagging, and should be stretched fairly tight. Then cut 7 pieces of hoop iron, 8 inches long, bend these into the shape of a socket to receive and hold in position the projecting ends of the rails of the hurdles. Nail one of these sockets on to the left hand side of each of the centre partitions at the height of the hurdle, and 2 more sockets on the outside of each end of the coop at the proper distance to receive the top and bottom rails of the outside hurdles. The ruberoid can now be securely nailed on to the roof, sides and back.

The nests, made from kerosene tins, should be hung on the wire netting partition nearest each end, and the bottom of the tin should be 16 inches from the ground. The perches should be made of 2 x 1 hardwood on the flat the full width of the compartment and should have a hook in each end, so that they may be hung on the wire netting partitions, and easily removed, when necessary, for examination for vermin. These perches should be hung 18 inches from the ground and 14 inches from the back of the coop.

All perches should be given a coat of hot tar to fill up any cracks in the timber to prevent vermin from breeding there.

The floor of the coop should be covered with scratching material to a depth of 4 or 5 inches: Cocky chaff or short straw is best.

The timber for the hurdles should be cut as follows:—

1	piece	of 2 x 1	8 ft. 2 in.
1	,,	,,	7 ft. 10 in.
7	pieces	,,	6 ft. 3 in.
3	,,	,,	6 feet.
5	,,	,,	2 ft. 6 in
8	,,	,,	2 ft. 9 in.

One end of each of the 8 pieces of 2 ft. 9 in. should be pointed, so that they can be easily driven into the ground.

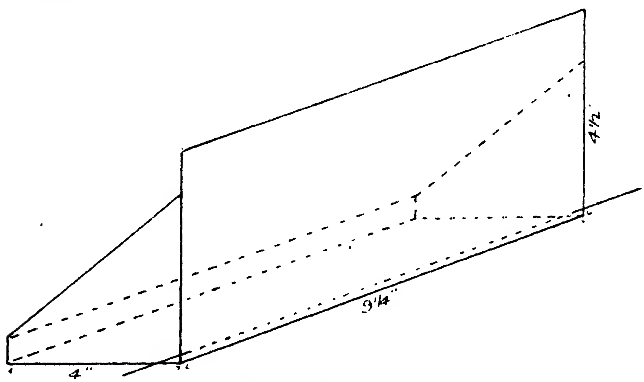
To make the hurdles lay the 8 ft. 2 in. and the 7 ft. 10 in. lengths 2 ft. 2 in. apart. Then take 3 pieces of 2 ft. 9 in. and nail one to each end of the 7 ft. 10 in. piece and one in the centre, then nail these to the 8 ft. 2 in. piece, allowing 2 inches to project at each end. This hurdle is to go across the ends of the yards. Then take 2 pieces of 6 ft. 3 in. and lay them down 2 ft. 2 in. apart; nail a piece of 2 ft. 9 in. to the right hand ends; next take a 2 ft. 6 in. piece and nail on 3 inches from the other ends; these projecting ends of the top and bottom rails are inserted into the hoop iron sockets attached to the left hand side of the coop. Take two more pieces of 6 ft. 3 in. and proceed, as before, but nail the 2 ft. 9 in. piece to the left hand ends; this hurdle fits into hoop-iron sockets attached to the right hand side of the coop. Next lay out a 6 ft. 3 in. length and one of 6 feet 2 ft. 2 in. apart, and nail a 2 ft. 9 in. piece on the the two ends, and a 2 ft. 6 in. piece to the end of the 6-ft. piece and 3 inches from the end of the 6-ft. 3-in. piece; the end of this rail is inserted into the hoop-iron socket in one of the partitions, and the bottom of the hurdle is held in position by two cleats of wood nailed to the bottom of the coop. Three of these hurdles are required.

To hold the hurdles together at the corners a neat fastening can be made as follows:—Bore two small holes through the upright batten of one hurdle 9 and 10 inches respectively from the top, and one hole through the upright of the other hurdle 9½ inches from the top. Take three short pieces of 16 gauge wire and bend them into the shape of three hairpins; push the double end of one through each hole (leaving a loop ¼-inch in diameter), bend the ends over and secure with a small nail to prevent them pulling out. When the hurdles are erected in position these loops will be in line; through the three loops pass a pin made of No. 8 fencing wire, or else a 3-inch nail; this will hold the corners securely together.

Cut the timber for the hurdles to cover the yards as follows:—

Four pieces of 2 in. x 1 in., 5 ft. 2 in. long.
Two pieces of 2 in. x 1 in., 4 ft. 2 in. long.
Two pieces of 2 in. x 1 in., 4 feet long.

Make these into two hurdles, one 5 ft. 2 in. by 4 ft. 2 in., and the other 5 ft. 2 in. by 4 feet. Cover all hurdles with wire netting. These hurdles do not require any fastening as their own weight will hold them in position.



A Feed Trough for the Pen.

FEED TROUGHS.

Four feed troughs can be cut from one kerosene tin. The bottom of the trough should be cut 5 inches to allow of 1 inch being turned up to make the front, a piece of No. 8 fencing wire should be passed through a hole punched at each end of the trough at the angle.

A piece of wire netting should be cut out large enough for the trough to be fitted in, and the No. 8 fencing wire fastened to the netting. The trough will then fold outwards so that feed can be put in, and its own weight should cause it to fall back into position.

Water vessels may be hung under the weatherboard verandah where they will be sheltered from the sun's rays, and be in a position convenient for filling.

BROWN ROT OF STONE FRUITS.

(*Sclerotinia cinerea* (*Bon.*) Schr. Monilia.)

W. Laidlaw, B.Sc., Biologist, and C. C. Brittlebank, Plant Pathologist.

During the past season a series of experiments were carried out at Bairnsdale in the peach orchards of Mr. C. Goodman, and while we believe it premature to give any definite pronouncement on a single season's experiments, still some of the sprays were so successful that we consider it will be advantageous to growers of stone fruits if we give a short description of the disease, and a *résumé* of the experiments.

Brown rot is probably the most destructive disease of peaches, plums, cherries, and kindred fruits. Apples, pears, and quinces are also attacked, though not to the same extent in Victoria.

Brown rot attacks the twigs and flowers, but it is most evident on the fruits as they approach maturity. It first appears on the fruit as small spots, which enlarge rapidly. As the decay advances, small grey tufts appear near the centres of the original spots and spread very rapidly, covering the whole of the fruit in from 30 to 48 hours. If fruits touch each other the disease spreads from the points of contact until the whole bunch is affected. Diseased fruits may remain on the trees throughout the winter as "mummies," or they may fall to the ground and shrivel up, resembling the "mummies" on the trees.

On the blossoms the disease first appears as a brownish discolouration, giving the flower a frosted appearance. The disease spreads rapidly, and the flowers fall off as a rotten mass, carrying contagion to everything in their path. From the flowers the disease may spread to the twigs, which are also often affected directly from diseased fruits, especially where wounds are found.

The casual fungus is carried over the winter in the mummified fruits, in the cankers on the branches, and in the bud scales. If a "mummy" be examined in the spring time, very small stalked discs, resembling very small toadstools (ascophores), will be found; these furnish the spores for the spring infection.

In attempting to combat the brown rot, all twigs and branches showing cankers must be removed. These, along with all mummified fruits, whether on the ground or remaining on the trees, should be collected and burned or buried so deeply that cultivation will not disturb them. Pollock has shown that the sclerotia of the fungus causing the disease may remain alive for at least ten years; it is therefore good practice to destroy all diseased fruits by fire.

Experiments.

The season 1920-21 in the orchards at Bairnsdale was a disastrous one, over 75 per cent. of the peaches being destroyed by brown rot. Our first work was to collect all the "mummies" and to remove as far as possible all twigs and branches showing cankers and to burn all the diseased material.

The following sprays were used on 28th July, 1921, when the trees were quite dormant:—

Commercial lime sulphur, 1 in 9.
Copper soda, 6 : 9 : 40.
Bordeaux mixture, 6 : 4 : 40.
Neutral copper acetate, 3 lbs. to 40 gallons.
Sopper sulphate, 1 in 10.

(The above sprays were again used when the buds were showing pink.)

Commercial lime sulphur, 1 in 20.
Copper soda, 3 : 4½ : 40.
Bordeaux mixture, 3 : 2 : 40.
Neutral copper acetate, 3 lbs. to 60 gallons.

Copper sulphate was not used at this stage, atomic sulphur 1 in 10 being used instead.

The third spray was used three or four weeks before the fruit was ready for picking. Commercial lime sulphur 1 in 30 and 1 in 40 and atomic sulphur 6 lbs. to 60 gallons being the sprays used.

In some cases, namely with the copper soda, Bordeaux and copper acetate, an extra spraying with self-boiled lime sulphur 8.8.50 was given five weeks after the second spray.

The varieties treated were Pullar's cling, 66 trees; Tuscans, 293 trees; Goodman's Choice, 38 trees.

Results.

With commercial lime sulphur we got the best results, there being no brown rot, no leaf injury, and the trees were entirely free from peach aphis. Bordeaux and copper soda with the different third and fourth sprays gave very good results, so far as brown rot is concerned, but the trees had to get an extra spraying for peach aphis.

Copper sulphate and copper acetate were the least effective.

We wish to express our appreciation of the work done and assistance rendered to us by Mr. L. Pilloud, Orchard Supervisor. We are indebted to him for the practical application of the various sprays, and also for the very careful records taken of their action on the control of the brown rot.

SECOND GRADE CREAM.

TWO COMMON CAUSES.

(By F. Fincher, Dairy Supervisor).

A farmer always claims that his cream is a superfine article. Thus, when the grader thinks differently, and classes some of his consignments as first or second grade, he will invariably attribute the fault to the factory staff—never is he himself to blame! The factory wants only superfine cream; they may take the poorer quality when there is insufficient superfine to work with, but it is much more satisfactory to everybody when perfectly sweet cream is supplied.

From the time the cows are milked till the cream reaches the factory there are several ways in which the quality of the cream may be caused

to deteriorate, and, broadly speaking, dirt in some form or other is the root of the trouble. The dairyman may be fully aware of the injurious effects of cow-yard filth and other forms of dirt, but, unfortunately, he does not always realize that stale milk or cream is equally contaminating.

It is still all too common to see a milker working with dirty hands; while many do not yet realize the necessity for cleaning the udder and teats of each cow before milking. As much dust collects on the udder of a cow as on the neck of a horse; but where is the farmer who will not spend some time in grooming his horse before harnessing up? Yet, the same man will often milk his cow without first brushing or wiping the udder. The fact stands that, unless some such cleansing is done before each milking, the milk must be in some measure tainted. Of course, the milk goes through the separator, which is supposed to remove all dirt, but the dairyman, who depends on the separator to do to the cream what he himself should have done to the milk, will pay for his neglect when the cream drops to a lower grade. Unwashed udders and milking with wet hands cause loss to many a farmer every year—possibly to the price of a good cow—through reduced cream values.

In the subsequent handling of the cream, it is surprising again how many people will stir with a dirty stick, and be apparently unaware of the dirt. After separating, and before mixing it with the cream of previous milkings, cream should be cooled by standing the vessel containing it in cold water. Then, when it is put into the factory-can, it should be stirred, but not with a stick coated with stale cream. Stale cream is sour cream. Sour cream is full of bacteria life; and bacteria, whether from simple dirt or from over-sour cream, will turn a can of fresh cream into a second grade product within a few hours. The stick used for stirring cream should be washed after each using, the same as the milk strainer or separator bowl. A metal cream-stirring contrivance on the line of the elongated egg-beater would be the best of all, but whether of metal or of wood the stirring instrument should be scalded regularly.

The individual who stirs cream with the same stick for days in succession without once washing it, would make quite a fuss if asked to stir tea with a spoon which had not been washed after the previous meal. Yet why? A soiled tea spoon may offend only the sense of cleanliness in the drinker, while the dirty cream stick will cause trouble at the factory which will result in the owner of the cream getting cross about the grading; in addition, it will make the cream cheque smaller. Cleanliness in dairy work is at all times profitable.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Pruning.

Pruning operations will now be in full swing. In pruning the young trees, heavy pruning will be required in order to produce strong growths and a good frame, but as the tree advances in age the pruning will be reduced considerably. It should be remembered that strong, heavy

pruning results in wood growth, and that weak pruning steadies the tree, and promotes an even growth. When framing and building a tree. the former consideration is observed, and when the tree is coming into fruit bearing or is mature, it will be pruned according to the latter. Any operation that will cause the tree to produce less wood growth will induce the tree to become more fruitful, provided the tree be in a healthy condition; so that when trees are mature, pruning operations, as a rule, should not be severe, but rather the reverse.

Old fruiting wood, and dead and dying wood should always be removed, and aged spurs should be considerably reduced, in order to make them produce new growths. Crowded and overlapping laterals should be shortened back; fruit-bearing in the higher portions of the tree should not be encouraged; and due consideration should be given to the admission of light and air to all parts of the tree.

Where varieties of fruit trees are prone to bearing crops every second year, their lateral system should be pruned so that they will not produce too heavy a crop in the fruiting year; and at the same time they will produce wood in their fruiting year to give a crop in the subsequent season.

A model tree will always be light on its topmost leaders, bearing the major portions of the crop in the lower regions of the tree. The main point to be noted is that a heavy wood growth in the upper portion of the tree tends to reduce the bearing capabilities of the tree in its most useful parts.

DRAINAGE.

The rains of winter will always show the necessity for draining orchards. Where under-soil drains do not exist, the trees are bound to suffer. If the damage is not immediately apparent, it will be later found that in some way loss will accrue. Either the tree will be weakened by the loss of roots through rotting, or it will be devitalized so that it will not carry a satisfactory crop of fruit. Too often surface drainage is relied on to remove the so-called surplus water. There should be no surplus water for surface drains. The water is only surplus or excess when it is in the soil. Two circumstances, and two only, permit of surface drainage. First, when it is necessary to carry away excessive stormwater; and, second, when it is practically impossible to find an outlet for under-drains, owing to the low-lying situation of the area.

The term "surface drainage" does not apply to open drains, which, owing to their depth, act also as soil drains; neither does it apply to graded surfaces which allow a more equitable distribution of water. Surface draining is usually applied to a system, whereby a considerable quantity of water is removed by gravitation before it enters the soil. Such a system cannot be too roundly condemned. As much water as can be obtained by natural means should be induced to enter orchard soils; and then whatever is in excess will be carried away by under drainage, provided that drainage, either natural or artificial, be in existence.

Where suitable drainage is not provided, the tree roots are compelled to remain in a few inches of surface soil. Their feeding area is thus extremely limited indeed; and when, at any time, rain-water does

filter and penetrate through the soil, it carries with it the soluble and other plant foods, below the reach of the tree roots.

Soil ventilation is only possible with a system of drainage, and air is as necessary to the roots of a tree as it is to the foliage. By the removal of the surplus water and the consequent admission of air into the soil, the soil temperature is rendered far more equable, warmer in winter and spring, and cooler in summer; and such a change must be beneficial to the trees.

Drainage is thus an essential for all orchard lands. When natural drainage occurs, the orchardist is fortunate; but whether natural or artificial, a system of drainage will always materially increase the crop of fruit, strengthen the trees, and considerably add to their term of life.

Drainage schemes should be carried out at the present season of the year. In closed drains, such drainage media as cinders, charcoal, stones, brushwood, timber, logs, or tile pipes may be used, but the latter generally give more satisfactory and permanent results. They are also less liable to silting up than any other material.

Drains should be placed into the clay, if this be not too deep. In any case, they should be below any possible interference from cultivating instruments.

SPRAYING.

In order to keep in check such pests as Bryobia, scale insects, woolly aphis, and others, a strong and forcible spraying with lime sulphur or red oil spray should not be delayed any longer. The whole tree should be thoroughly wetted with the spray. A good, vigorous, and thorough winter spraying will place a large majority of the trees in quite a satisfactory condition of freedom from these pests for the whole year.

The lime sulphur spray is an excellent fungicide, and a strong winter spray will go a very long way in reducing any attack of the black spot fungus on either the apple or the pear. In addition, if the peach trees are sprayed at this time with lime sulphur, both peach aphis and peach leaf curl will be considerably minimised in the spring time.

The Flower Garden.

Digging in the garden should be continued. Before digging, the beds should be given a top dressing of lime or stable manure, and subsequently these should be dug well into the soil. Care must be taken not to injure the roots of any shrubs, trees, or roses. Root cutting and root pruning will always dwarf any plant. In digging, it is not wise to discard any leaves, twiggy growths, or weeds. Unless they are required for the compost heap they should always be dug into the soil. Leaf-mould is especially useful in any garden, and where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot-plant work, it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects. The plants mentioned above strongly object to lime.

All shrubs that produce flowers on their young growths, including roses, should now be pruned. Care should be taken to distinguish between those shrubs that flower on the new wood and those that flower on the wood of the past season's growth. Those that flower on the new wood, and may now be pruned, are Lantana, Cestrum, Tecoma, Hydrangea, Plumbago, Erythrina (some species), &c., and those that should not be touched at present time are Spirea, Erythrina (some species), Pyrus Japonica, Weigelia, Prunus pissardi, P. Vesuvius, P. mume, Deutzia, Polygala, Ceanothus, &c. It is a safe rule in pruning shrubs to wait until they have flowered before pruning. This will certainly give the shrubs a somewhat ragged appearance in the winter, but it is the only way to secure the best flowering results.

All herbaceous plants, such as Salvia, Aster, Delphinium, Polygonum, Boltonia, Gaura, and Chrysanthemum, should be cut back, and, if necessary, lifted and "heeled in" in a temporary location for the winter. Plant out early Gladioli, Iris, and Liliums.

Continue digging, manuring, and trenching.

The Vegetable Garden.

Seedlings from boxes or seed plots may now be planted out. Care should be taken that all vegetable beds are well raised and thrown up. By throwing up the soil, and thus deepening the paths and the spaces between the plots, the latter are well drained, and the soil is made considerably warmer. This will greatly facilitate the growth of the young plants.

Asparagus may be planted; sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes, the latter being forced on in a frame, so as to obtain good plants quickly.

REMINDERS FOR AUGUST.

LIVE STOCK.

Horses.—The feeding and general management of horses recommended for July will also apply for this month. Horses, more especially young ones, running on low-lying country are liable to become affected with internal parasites. This will be recognised by the unthrifty and poor condition of the animals; in such cases medicinal treatment will be necessary. If the following lick be made available, it will not only be of great assistance in preventing serious invasion, but in cases where worms are not in large numbers, the repulsion of them from the intestinal tract will result:—

Lick.

20 parts salt.
10 do. lime.
1 do. sulphate of iron.

If possible, be with mares at foaling, so that the navel cord may be properly tied and thoroughly treated with antiseptic, and thus prevent that very fatal disease, navel or joint ill. Wash cord with one part of corrosive sublimate to 3,000 of water, and soon after paint with tincture of iodine. The iodine treatment must continue till the cord has completely dried up.

CATTLE.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

PIGS.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

POULTRY.—Yards should be turned over with a spade or fork, and sown down with rape or barley. Keep the breeders busy—straw litter with a little grain scattered about will make them exercise. Overhaul incubators; see that the capsule of thermostat acts properly; thoroughly clean lamps, egg drawers, and chimneys. Test machine for two days before putting eggs in. It is also advisable to have thermometer tested. When additional incubators are required, it is more satisfactory to keep to the one make.

CULTIVATION.

FARM.—Second fallow where necessary for summer crops. If required, roll or harrow crops. Plant very early potatoes in forward districts. Sow mangolds. Apply slow-acting fertilizers, such as blood and bone manures, for maize.

ORCHARD.—Complete planting and pruning of deciduous trees. Watch for peach aphis, and spray with tobacco solution, if present. Prepare for planting citrus trees. Spray for woolly aphis with lime sulphur or red oil spray.

FLOWER GARDEN.—Finish digging and pruning of roses, &c. Leave pruning of shrubs till after flowering. Keep weeds in check; weed out seed beds. Divide and plant out all herbaceous plants, such as phlox, delphiniums, rudbeckia, &c. Plant out gladioli. Complete planting of shrubs. Mulch young plants.

VEGETABLE GARDEN.—Top-dress asparagus beds; plant new asparagus plots. Plant herb divisions, and potatoes. Sow cabbage, cauliflower, peas, carrots, beans, radish, and lettuce seeds. Sow tomato seeds in a hot frame. Finish digging.

VINEYARD.—August is the best month for planting vines (grafted or ungrafted). This should be actively proceeded with and completed before end of month. Scions for field grafting may still be preserved as detailed last month, or better still by placing them in cool storage. They should all be removed from vines before end of month, at latest. Conclude pruning and tie down rods. Where black spot has been prevalent, apply first acid iron sulphate treatment. Owing to the dry spring, black spot was not in evidence last season. The fungus is not dead, but dormant, hence preventive treatment must not be neglected. Leaflets dealing with black spot and its treatment will be supplied on application.

Cellar.—Rack again, towards end of month, wines which have as yet only been once racked (spring racking). Fill up regularly all unfortified wines. Clean up generally in cellar and whitewash walls, woodwork, &c.

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INTER-DISTRICT FARM COMPETITION FOR THE MALLEE.

ROYAL AGRICULTURAL SOCIETY'S THIRD COMPETITION (1921-22).—PRIZES £100.

Report of the Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer, Department of Agriculture.

Steward—J. Keane, B.Ag.Sc.

Hitherto the Royal Agricultural Society's Farm Competition has been confined to those members of local agricultural societies who won a prize in a current District Crop and Fallow Competition. That led to competition between farms in districts as fundamentally different as the Mallee and the Wimmera, with consequent difficulties in determining a fair basis of comparison. When the original rule was framed this disability was recognised, but as the Mallee farms then likely to enter were so few, it was not thought worth while to make special provision for them.

This year, however, the venue of the competition was changed to the Mallee, with the result that nine farms on Mallee land—prize winners in local crop and fallow competitions—were entered for the royal prize. The following districts, in which some mallee land occurs, were represented:—Beulah, Warracknabeal, Nhill, and Dimboola. Several of these districts are located on the mallee fringe, and it so happens that four of the competing farms are situated in areas where the actual change of timber from box and buloke to mallee occurs. In none of the cases, however, does the area which is not mallee constitute more than an inconsiderable proportion of the farm; hence, for

the purpose of the Competition, the farms were regarded as wholly Mallee.

JUDGING THE LOCAL COMPETITIONS, 1921.

The limitation for the time being of the Royal Competition to the Mallee has not resulted in any falling off of interest in the local competitions in the Wimmera. On the contrary, both in numbers of entries and in farms visited, there was a marked increase as compared with last year.

The following table shows the number of farms visited and entries judged:—

Table showing Details of Local Competitions conducted by Agricultural Societies, and judged by Officers of the Field Branch, 1921.

District.	No. of Entries.	No. of Farms Inspected.	Type of Competition.
Nhill	75	27	Farm, Crop and Fallow Competitions
Rupanyup ..	53	27	Crop and Fallow Competitions
Warracknabeal ..	39	23	,, ,, ,,
Minyip	20	15	,, ,, ,,
Dimboola ..	29	19	,, ,, ,,
Goroke	27	15	,, ,, ,,
Horsham.. ..	17	11	,, ,, ,,
Kaniva	32	10	,, ,, ,,
Donald	24	17	,, ,, ,,
Beulah	48	43	,, ,, ,,
Benalla	4	3	Fallow Competition
Totals ..	368	210	

Note.—Some Mallee land occurs in the following of the above districts:—Nhill, Warracknabeal, Dimboola, Beulah.

In all there were 368 entries in the different districts, and 210 farms were visited. The judging took place during November and December, and occupied me fully for about five weeks, and Science Field Officer J. Keane and Field Officer I. M. Tulloh about three weeks each. Apart from railway journeys, about 3,000 miles of road travelling were involved. The whole of the cost of this was borne by the farmers themselves. Some 30,000 acres of wheat and 15,000 acres of fallow were subjected to careful investigation and classification. The exhibitors were closely questioned as to their farming methods, and complete records were taken. This information, correlated with the crop yields, was embodied in the form of reports furnished to each society for publication in the press. In many instances the societies have reprinted it in pamphlet form for distribution locally.

In districts where there are Government experimental plots, a Farmers' Field Day at the plots was held during the Competition, and the opportunity was taken of demonstrating the results of the experiments and of discussing local problems.

From the results of the local competitions a list of first and second prize winners whose farms were on mallee land was prepared and presented to the Royal Agricultural Society.

JUDGING THE ROYAL COMPETITION, 1922.

The farms of the nine competitors who qualified for entry were inspected in April and May. Points were allotted according to the scale set out in the table showing details of the awards—25 per cent. of the marks are given for the farm considered as a business. Special attention was paid to this aspect, and an accurate business analysis was made. From the Federal income-tax sheets the revenue and expenditure for each farm activity were determined. In addition, the land and improvements, plant and implements, live stock and fodder reserves were valued, in order to arrive at the capital investment. From these figures the profit was ascertained, and hence the "labour income," as well as the rate of interest earned on the capital. The "labour incomes," *i.e.*, what is earned after deducting 5 per cent. on the capital, were then compared according to a sliding scale based on the size of the investment.

An endeavour was made to determine these figures for the three-year period 1918-19, 1919-20, 1920-21 as in previous years; but as several of the competitors had acquired their farms within that period, this could not be done in all cases. The awards for business, therefore, relate to the year 1920-21.

TABLE ILLUSTRATING THE TYPES OF FARMING FOLLOWED BY THE VARIOUS COMPETITORS.

Name.	Area.	District.	Main Source of Revenue.	Average Area in— Wheat.	Oats.	Fallow.	Grass.	Average No. of Sheep carried.	Cultivation, per cent. of total area.
	acres			ac.	ac.	ac.	ac.		
J. R. Kennedy*	968	Beulah ..	Wheat ..	400	150	400	18	20	98%
A. T. Couznert†	1,008	Beulah ..	Wheat and sheep	400	100	500	150	300	..
Schneider Bros.	1,280	Beulah ...	Wheat and sheep	400	300	400	180	130	86%
J. Bryant* ..	1,280	Beulah ..	Wheat and sheep	350	180	350	400	290	69%
W. T. Fish* ..	1,350	Beulah ..	Wheat and sheep	380	380	380	210	150	84%
C. F. H. Reichelt	1,350	Nhill ..	Wheat and sheep	250	130	250	720	200	47%
Geo. Coutts ..	1,360	Warracknabeal	Wheat and sheep	300	100	300	660	400	55%
C. A. Mibus ..	2,080	Dimboola ..	Wheat and sheep	600	200	600	680	300	67%
M. E. Schulz & Sons	3,270	Warracknabeal	Wheat and sheep	900	100	900	1270	800	58%

* These competitors have recently acquired improved farms in the district. The system given is the one they propose to follow.

† Rents 140 to 160 acres each year from September to December.

The areas of the competing farms ranged from 968 acres to 3,270 acres, but the majority averaged about 1,280 acres, or two square miles. Wheat, of course, is the main source of revenue, but is supplemented

in most cases by returns from sheep grazed on the stubbles and on land resting in grass.

While the proportion of land cropped on individual farms showed fairly wide divergences, the cultivation methods agreed closely and reflected most of the modern advances. A proportion of the land in most cases is summer-fallowed, the fallows are thoroughly cultivated, the quantity of seed used approximating 65 to 80 lbs., and the amount of manure used is from 80 to 120 lbs. From this it will be seen that the best farmers in the older Mallee are falling closely into line with the best Wimmera practices.

On the whole, the improvements compared favorably with the older settled districts, though in some cases a lack of careful planning was noticeable in the layout of the farm buildings. Almost in every instance the homestead was a comfortable one with a garden. In the house usually were to be found such modern conveniences as lighting system, piped water supply, cool cellar, telephone, and in one instance an up-to-date sewerage system.

Attractive Homestead of limestone and brick, of Mr. A. T. Couzner, Beulah, the winner of the Competition.

RESULTS.

The first place was awarded to Mr. A. T. Couzner, of Beulah. This farm showed all-round excellence, and the rate of interest earned on the investment during 1920-21 was good. The property consisted of 1,008 acres of undulating mallee country, but a further area of from 140 to 160 acres is rented for grazing purposes from September to December. Almost the whole of the home farm is cultivated. Usually about 400 acres are sown to wheat, 400 are fallowed, and 100 acres of oats are sown on late fallow, that is on land worked up immediately after harvest. The oats are then seeded much later than is the usual practice—an interesting feature. As a rule, a number of small home paddocks, totalling 30 acres, are sown to barley as forage for the dairy cows.

The fallows are carefully cultivated. Federation is the variety of wheat preferred, 65 to 80 lbs. of seed being used, together with 90 to 120 lbs. of superphosphate. The farm is well laid out. The water supply, of which the home dam of 6,500 cubic yards capacity constitutes an effective feature, is good.

The homestead is a substantial and attractive one of local limestone faced with brick. It commands a comprehensive view of the farm and the surrounding country. There is a neat garden. The farm buildings are conveniently arranged and, for the most part, solidly built. The fodder reserves and the live stock were satisfactory.

Messrs. M. E. Schulz and Sons, "Home Grange," Areegra, were awarded second place. This is a large farm of 3,270 acres, situated on the Mallee fringe, about 14 miles east of Warracknabeal. The most notable feature was the high rate of interest earned on the investment—a somewhat rare occurrence on a wheat farm of so large an area. The results obtained can be attributed largely to the fact that this farm is run by Messrs. Schulz and Sons on partnership lines—little or no hired labour being employed—and also to the special methods adopted for saving labour, of which more will be said later. On this property the best horses in the competition were noticed, and a further point of interest was the adoption of a system of seed selection for wheat similar to that practised at the State Farms. All wheat grown is the progeny of wheat continuously hand selected for improved yield.

The large farm owned by Mr. C. A. Mibus, situated a few miles from Antwerp, was notable for a most attractive home, orchard, and garden, and for systematic arrangement of the farm buildings. Liberal use of shade trees had been made about the homestead, entrance drive and buildings. Other features were a most up-to-date set of farm implements and an excellent water supply.

A competitor who scored most consistently in many departments was Mr. Geo. Coutts, of Batchica, Warracknabeal. The homestead is a comfortable one, replete in modern conveniences, including a sanitary system with septic tank. The farm buildings are substantial, though the stable is at present somewhat inconveniently located. The water supply to the homestead is derived from a well of sound construction. The homestead and paddocks are supplied by a convenient system of pipes, troughs, and dams. Mr. Coutts maintains a small stud of Merino sheep, as well as one of New Zealand Corriedales.

On this farm the local Government subsidy experimental field has been located during the past ten years. Mr. Coutts practises with success the lessons that they teach.

The remaining farms all had individual points of interest. Mr. J. R. Kennedy's farm has a fine modern home in a pleasant environment. Messrs. Schneider Bros. practise a rotation system, in which more than the usual quantity of oats is sown. Mr. C. F. H. Reichelt's cultivation methods are most thorough, and his farm buildings well planned and very solidly constructed. The main water supply is from a deep well. Mr. W. T. Fish, a newcomer to the Mallee, has a substantial homestead and farm buildings. There were ample supplies of hay, unusually well thatched and stacked. Mr. J. Bryant is also a newcomer to the Mallee and a returned soldier. His farm was not as highly improved as those of the other competitors, but he has made a satisfactory beginning, and

TABLE SHOWING SCALE OF POINTS AND DETAILS OF MARKS AWARDED.

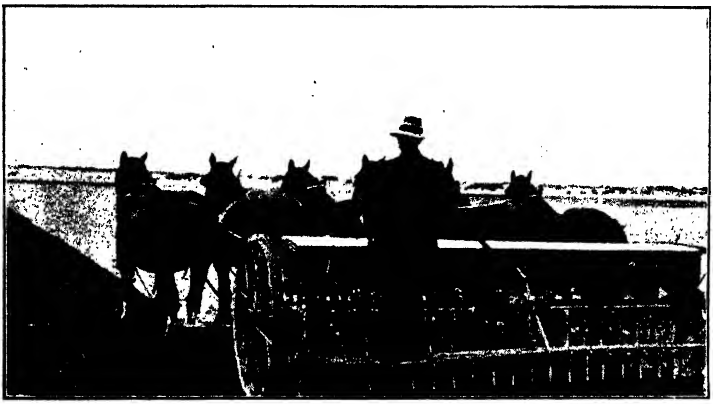
Name.	Best Method of Cropping, Rotation, and Methods of Cultivation.	Character, Condition, and Value of Farm Crops.	Fallow.	Horses.	Sheep.	Cattle.	Pigs.	Poultry.	Machinery and Equipment.	Character and Arrangement of Farm Buildings.	Water Storage.	Fences, Gates, &c.	Fodder Reserves.	Trees for Shelter.	Orchard and Vegetable Garden.	Insurance.	Home.	Total.	Business.	Grand Total.
Maximum Points	**25**	**25**	**10**	**15**	**10**	**5**	**5**	**5**	**15**	**10**	**25**	**10**	**25**	**5**	**5**	**5**	**25**	**225**	**75**	**300**
A. T. Couzner	18	19	9	9	8	4	..	5	10	9	20	7	16	3	2	3	20	162	70	232
M. E. Schulz & Sons ..	17	21	9	13	7	4	2	2	12	7	17	7	16	2	2	1	16	155	74	229
C. A. Mibus	18	20	8	9	6	3	3	4	13	7	20	5	15	3	4	1	23	162	58	220
Geo. Coutts	19	18	9	9	9	3	3	4	11	7	21	8	17	2	2	1	22	165	33	198
J. R. Kennedy	18	20	7	6	7	2	2	2	8	6	17	6	17	3	4	3	19	147	45	192
Schneider Bros.	21	19	6	6	4	3	2	3	10	5	16	6	19	..	1	4	12	137	52	189
C. F. H. Reichelt	16	21	9	11	5	2	4	3	9	9	19	9	14	..	3	4	13	151	30	181
W. T. Fish	20	15	8	7	8	2	2	2	7	8	18	8	21	3	2	3	18	152	15	167
J. Bryant	16	18	8	8	5	2	..	3	7	4	15	5	22	..	1	2	8	124	10	134

one thing in which he outdistanced the whole of the other competitors was the extent of his fodder reserves.

These and other features of interest will be discussed in detail under the appropriate headings.

CROPPING METHODS IN THE MALLEE.

Comparison between these farms in the older settled portions of the Mallee and those in the Wimmera does not reveal many vital differences in the cropping methods and rotation systems adopted. Indeed, the tendency in the Mallee is to closely emulate Wimmera methods in detail, save in the matter of late sowing, and even here there are instances where that practice is also being adopted in the more southerly portions of the Mallee. The system followed by Mr. C. N. Mibus, of Katyil, near Antwerp, is a case in point. He finds that he secures the best crops on Mallee land by delaying his wheat sowing until the first week in June. Further north, however, one would doubt the wisdom of this practice; but the fact is that, through careless farming, the Mallee land



Seeding the Oat Crop on farm of Mr. W. T. Fish, Beulah.

is fast becoming so foul with weeds, that farmers are being forced to unduly delay seeding their wheat in order to destroy the persistent rubbish by successive cultivations.

One Wimmera practice which those in the older Mallee are begining to put into general use is the summer, or fifteen months' fallow. The experience everywhere is that by its means superior wheat crops can be grown; but where the land is dirty, and where crops require to be sown early, as they do in most of the Mallee, it has an especial advantage. By breaking up the land before the winter the autumn germination of the rubbish is secured at the beginning of the fallowing period instead of at the end. That means that on well-worked summer fallow the wheat may be sown in May, if necessary, with the certainty that it will be reasonably clean.

Messrs. Schneider Bros. and Messrs. J. Kennedy, W. T. Fish, and C. Reichelt all practise summer fallowing, though in the case of the latter it consists of burning the stubbles and lightly spring-toothing

the land only.' Mr. Reichelt regards it as most important to bury the ashes of the burnt stubbles, and so prevent their dispersal by the wind.

One interesting departure from normal Mallee seeding practice was noticed in the Beulah district. In some instances as much as 100 lbs. of seed per acre are used, and from 80 to 90 lbs. is quite common. This is heavier than one would suppose necessary for the relatively early sowing practised in the district, if the results of the test plots at Longerenong, 75 lbs. best, are to be taken as any criterion. The fact, however, remains that some of the best farmers at Beulah have adopted the method after careful test. Messrs. Schneider Bros. have used increasingly heavy seedings during the past four years, and claim to have noticed correspondingly increased yields.

In 1919—a season of many drought failures in the Mallee—their crop was heavily seeded and liberally manured for the first time. A five-bag average was secured over 300 acres. The result was an effective reply to those who said that the heavily seeded and manured crop would burn off in a dry year.

Summer Fallowing with 12-furrow Stump-jump Skim-plough.—
Mr. J. Kennedy's, Beulah.

Practically on every farm in the older Mallee some oats is now grown in rotation with wheat—generally on the wheat stubbles. As a rule, just as much is sown in this way as is required for hay purposes; but in some instances the whole of the stubbles are sown down. When that is done, the surplus is either disposed of as hay, or the growing crop is fed off to sheep. On the average for the nine farms considered 70 per cent. of the farm was cultivated annually to wheat, fallow, and oats, 28 per cent. being under wheat, 28 per cent. under fallow, and 14 per cent. under oats. These figures indicate that on Mallee farms 10 per cent. more of the land is cultivated annually than on Wimmera farms. On one farm the total area cultivated was as high as 99 per cent. and on one at the other extreme, 47 per cent. Recently, owing to the relatively high price for wheat as compared with sheep products, there has been a strong tendency for Mallee farmers to increase the area sown to wheat. That means a reduction in the number of sheep

carried; indeed, there was one competitor who kept no sheep other than a few killers. On farms where the conditions are comparable the profits, while prices are at present levels, appear to follow the increasing acreages sown. Of course, farmers who have been tempted by the relatively high prices for wheat to sow larger areas generally realize that the present system is in no sense of the word likely to remain a permanent one. They know that such a policy has the weakness of exposing the soil to a slow but steady drain on its fertility.

Few Mallee farmers as yet systematically grow oaten hay on fallow, though several sow a few acres that way for the purpose of getting good seed. The principal objection to the practice in the Mallee is the fact that when sown on well-worked fallow, oats ripen practically simultaneously with the wheat crop, resulting in a clashing of the hay carting with the harvesting. It is possible, however, that a compromise between the two methods cited will prove the solution of the problem—in other words, the oats will be sown on late fallow.

Mr. A. P. Couzner, the winner of the competition, regularly sows his oats in this way. The land to be sown to oats is worked up as early as possible, cleaned of weeds, and the oats sown after the first rain. If the quality of the hay stacked on this property is any criterion, the method has much to commend it. The resultant crop is cleaner and more bulky than the stubble oat crop, and it does not remain green for so long a period as one on fallowed land.

CROPS AND FALLOWS.

The fallows and details of the methods employed in growing the competition crops are fully treated in the reports of the district competitions furnished to the District Agricultural Societies and already published in the *Journal of Agriculture*. The most prolific crops submitted were those of Messrs. M. E. Schulz and Sons and Mr. C. F. H. Reichelt. The best fallows were those of Messrs. C. F. H. Reichelt, Geo. Coutts, A. P. Couzner, and M. E. Schulz and Sons.

LIVE STOCK.

Horses.

So far the breeding of high-class draught horses has not been practised to any extent in the Mallee, except in a few districts, notably in the fringe country near Warracknabeal, where the type of animal now used leaves little to be desired. In too many cases, however, Mallee teams of workers are an uneven lot, with a plentiful admixture of nondescript sorts showing evidence of light horse blood. To the critic of these it has become customary to justify their retention on the farm by claiming for them superior powers of pace and stamina under Mallee conditions. But those who have worked the modern Clydesdale of good breeding alongside them in the Mallee are under no misapprehension as to the relative value of each. The truth is that the half-bred horse is a relic of the pioneering days, where the hacks were pressed into place in the teams, and where any sort of horse was better than none at all.

In the greater portion of the district, however, those times have passed, and with them should go rough-and-ready horse-breeding methods. Mallee farmers should make greater use of those high-class Clydesdale studs that are available locally as well as in the Wimmera. If the job of replacing the nondescripts were systematically tackled,

an immense increase in the efficiency of the teams might be brought about, and from statistics gathered during the Competition it would appear that there is plenty of room for improvement.

Because the Mallee soils are light and easily cultivated, it is commonly argued that a team can put in a greater acreage of wheat there than in any other district; but the figures obtained, based on the number of acres sown and the number of working horses kept, fail to show that the Mallee teams have any advantage. Last year figures taken on seven representative Wimmera farms indicated that about 28 acres of crop (wheat and oats) were sown per horse. That also is the figure for the nine Mallee farms inspected this year. If the Mallee soils are easier to work, as undoubtedly they are, does it not appear that Mallee horses at present are not all that they should be?

The best horses exhibited were those in districts near the recognised breeding centres. Highest marks were secured by Messrs. M. E. Schulz and Sons, Warracknabeal, for their horses; Mr. C. F. H. Reichelt was next. Mr. Reichelt had some horses of excellent stamp, but the average ages were rather high. Marks were heavily deducted where sore shoulders and other remediable defects were noticed.

Sheep.

All the competitors but one had sheep. The apparent influence on the profits earned of the reduced number of sheep carried by some farms has been previously indicated.

A portion of Mr C. F. H. Reichelt's Merino Flock.

Under present conditions, both on Mallee and Wimmera farms of from one to two square miles in area, sheep do not appear to be an absolute economic necessity, either from the point of view of profits earned or from the aspect of farm management. But their presence is certainly desirable for soil-fertility reasons. On larger farms under existing labour conditions it is practically impossible to satisfactorily manage the wheat farm without sheep.

The Mallee is not Merino country—cross-breds are favoured, and in the older settled parts the fine-woolled types are preferred. The accepted practice is to buy a line of cross-bred ewes, breed freezer lambs from them for a few years, and then replace the ewes with a fresh line.

The New Zealand Corriedale is a breed that is becoming increasingly popular in the Mallee.

The highest award for sheep, nine points, was secured by Mr. Geo. Coutts, Warracknabeal. There are two small studs on this property—Merinos and New Zealand Corriedales. Mr. Coutts, after some considerable experience with the Merinos, is now replacing them with Corriedales. One objection to the Merinos is the dust, and another is the ease with which the dense Merino wool picks up the barley grass seeds with which the older Mallee is infested.

Mr. Couzner was awarded eight points for a very even line of Comeback ewes, which are mated with Lincoln rams. Mr. W. T. Fish showed 430 splendid Comebacks comprising 360 4-6 tooth ewes in lamb to Lincoln and Border Leicester rams, and also 70 Comeback wethers.

Other Cattle, &c.

Up to the present few Mallee farmers have paid much attention to the quality of their cattle, pigs, and poultry. But such is the attraction of pure-bred stock of the best class, that those who have the courage

Mr. A. T. Couzner's two fine Jersey Cows.

to purchase them will find a ready sale for the young progeny locally at enhanced prices. Apart altogether from the business aspect, the pure-bred animal engenders a special interest and pride on the part of those who have to tend them. Dual purpose cattle, such as Red Polls and the Shorthorn, appear the most useful types for Mallee conditions, if the numbers of young animals bred are likely to be considerable. Where the milk of one or two cows is the sole requirement, there is nothing better than the Jersey.

Mr. A. T. Couzner scored best under the heading of cattle with his two excellent Jersey cows. Messrs. M. E. Schulz and Sons had a good

Shorthorn bull, and a number of well developed young cattle. Geo. Coutts favours the Red Polls, of which he has a number.

None of the competitors had developed pig raising to any extent; but the advent of the self-feeder opens up the way for the Mallee farmer to a highly profitable side line which is not likely to make serious demands on his time. By means of this contrivance, crushed oats and barley may be automatically fed to the pigs, which thrive wonderfully well on the ration, practically from the time they are weaned. The crushed cereals are, of course, fed dry, the water supply being made available in a sparate receptacle. Where growing pigs also have access to a forage crop, such as barley or oats, as well, they fatten very quickly. Mr. Geo. Kerr. of Strathkellar, a well-known Berkshire breeder, installed the self-feeders last year with complete success.

In the majority of cases the poultry were of nondescript barnyard varieties, but Mr. Couzner had an excellent lot of White Leghorns of tested Wyuna strain.

The "Twin" type of Stump-jump Skim-plough (Messrs. Schneider Bros.)

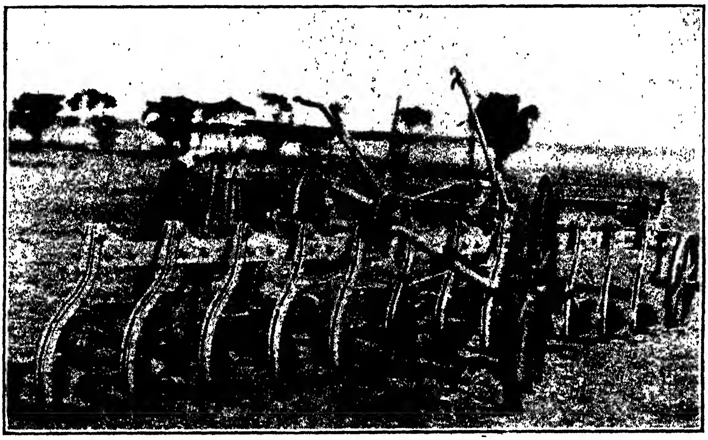
MACHINERY AND EQUIPMENT.

The plant now used in the older Mallee districts is similar to that in the Wimmera, except in respect to the type of implements adopted for cultivation. Despite the fact that a good deal of the land has been farmed for thirty years, sufficient of the stumps of the original mallee still remain in the ground to render the use of the ordinary set type of ploughs and scarifiers impracticable. Though modern stump-jump machinery is well designed, in practice the evenness of the work performed leaves much to be desired, and this is often accentuated by failure on the part of the drivers to keep the stump-jumping mechanism in proper adjustment. The principal fault in this connexion is uneven distribution of the "draught" to the feet. This frequently results in several of the shears merely scratching the surface of the soil with their points. When this is the case the land cannot be regarded as fallowed satisfactorily, even though the surface may appear in good

condition. This disability should cause farmers on the older mallee land, in cases where the stumps have been materially reduced in numbers, to consider whether it would not pay them to systematically mark and grub the remainder. The idea is, of course, opposed to accepted Mallee traditions, but it would enable cultivation implements having a much more positive tilling action to be utilized.

There is little doubt that increased yields would result from the more effective cultivation that could be given, and it is possible that they would soon pay for the cost of the grubbing, and leave a substantial profit besides. The point is worth testing.

Much of the fallowing is now done with the heavy type of "cultivating" stump-jump scarifier—one of the most effective implements yet introduced into the Mallee. This is made in two styles, one "straight" with the feet set one behind the other diagonally across the machine, and the other "twin" with the feet set in two parallel diagonal rows.



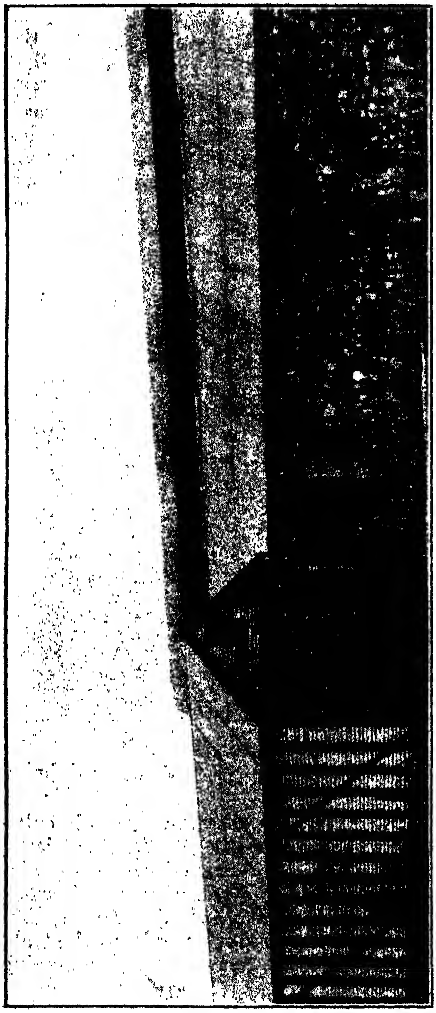
An effective type of 12-furrow Stump-jump.

The "straight" type is the most popular where the surface of the land is reasonably level, but the twins are preferred in crab-holey country.

For working over the land after fallowing, the spring-tooth cultivator and stump-jump harrows are generally used. With them it is, of course, necessary to kill weeds while they are still small. Disc cultivators are rarely used except to chop up "paddy melons" when they infest the fallow. Headers and reaper-threshers are rapidly displacing the combined harvesters, while strippers are rarely used at all. The combined spring-toothed cultivator-drill, too, is steadily ousting the ordinary seed drill.

The business survey disclosed that the amount of capital invested in plant and implements on the nine farms inspected ranged from £610 to £1,600, and averaged £1,120, equal to 7.7 per cent. of the average capital investment. This is no inconsiderable sum, and it must be admitted that, if an investment of this order is required for implements

and machinery on the Mallee farm, then the purchase of plant represents a crushing burden for the new settler. But he would not require such an elaborate plant as here indicated. Indeed, many of the machines, such as harvesters, are quite unsuited to new Mallee conditions, especially where there are loose sand hills. In any case, the values quoted are inflated by the recent purchase of costly implements of the very latest and largest size. While this progressive spirit is commendable in securing the highest labour efficiency, the installation of new machines can readily be overdone; for on some of the farms are to be seen combined harvesters and seed drills which have been discarded while in perfect condition, without regard to the present difficulty of obtaining a satisfactory price for them second hand. In installing a machine it is not good business to lose more in depreciation than is gained in efficiency. This machinery, together with strippers, is available to the new Mallee settler who is a keen buyer, or to one who can obtain sound advice.



Chaff-house and Stable at Mr. A. T. Couzner's.

On most of the competing farms the provisions for repairs to machinery was surprisingly poor, and some slackness was noticed in the maintaining of the plant in perfect condition—the stump-jumping machinery is here specially referred to.

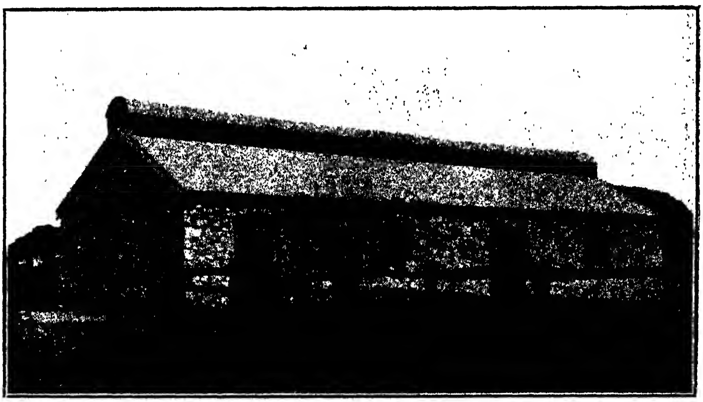
Mr. C. A. Mibus was was awarded highest marks for his plant. It consisted of one 9-ft. Taylor header, three 5-ft. combined harvesters, two 6-ft. binders, three waggons with broad tyres, four stump-jump ploughs, three combined drills, one spring-tooth cultivator, three scarifiers, thirteen leaves of harrows, two chaff cutters, one oil engine, 6 h.p., wool press, &c.

The Mallee competitors did not appear to show the same inventive ability which characterized several of those who entered in the Wimmera inter-district competition last year.

FARM BUILDINGS.

The principles which govern the effective lay-out of the farm buildings have been discussed in previous reports. Briefly, the more important requirements of farm buildings on a wheat farm are—

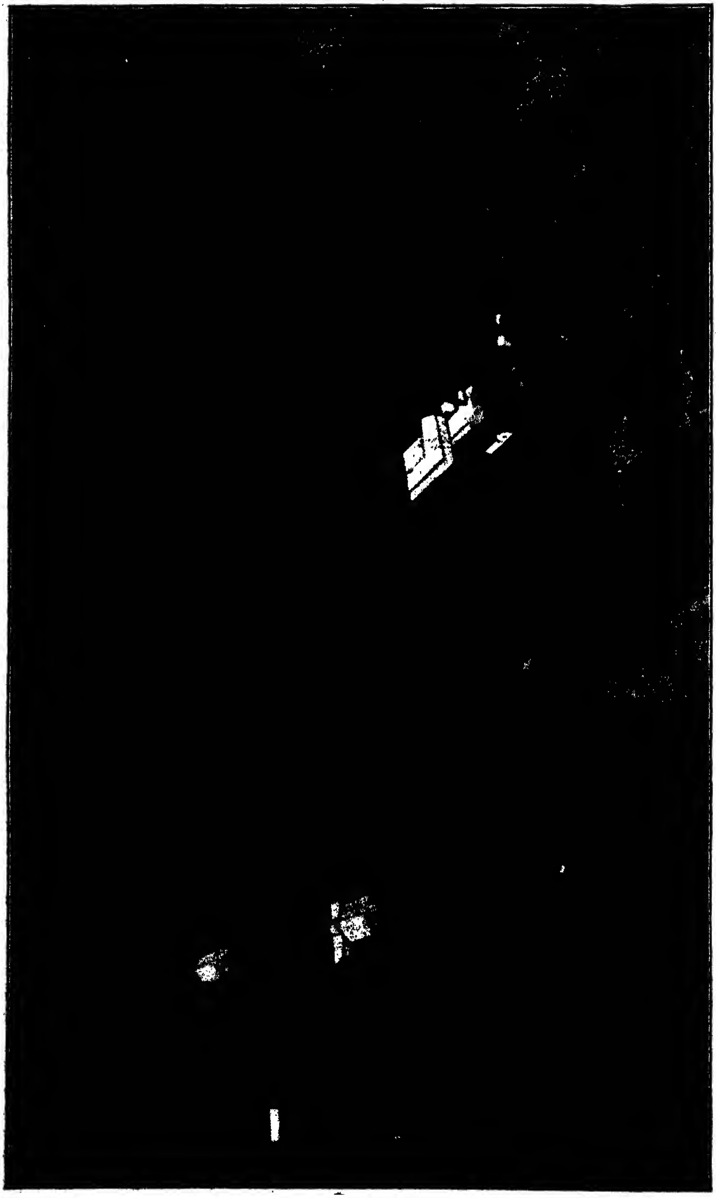
1. Effective feeding and stabling of each working horse.
2. Efficient handling of hay from stack to chaff-cutter, and thence to store and horse.
3. Protection from weather, animals, birds and vermin, of stored foodstuffs, and protection of any implements liable to deterioration from weather and damage from animals.
4. Provision for rapid and effective repairs to implements.
5. Ventilation and coolness of buildings in summer.
6. Moderate cost, durability, and accessibility.
7. Provision for catchment and storage of rain water from roofs.



Stable built of local Limestone (Mr. A. T. Couzner, Beulah).

In judging the farm, these points were considered, together with the relation of the sites of the buildings to the homestead and the farm as a whole. Attention was paid also to drainage, and the condition of the road surfaces about the buildings. Importance was attached to accessibility from the buildings to main roads and paddocks.

Of the several plans on which buildings may be arranged, perhaps the best is the open square design. Here the principal farm-steading is grouped about the four sides of a hollow square. All uncontrolled stock should be kept out of this area, which may then be maintained as a well grassed farm yard. Such a plan largely obviates the dust nuisance in summer, and in the winter mud is reduced to a minimum. Those buildings, such as stable, chaff house, &c., where ready access from one to the other is required, are, of course, placed close together. The horse-yard is kept separate from the farm-yard. On the whole



Aeroplane Photograph showing Homestead and Farmsteading, Water Supply, &c. (Mr. C. A. Mibus', Antwerp).

the buildings seen, though often of solid construction, were rather poorly arranged. The most substantial were those of Mr. C. F. H. Reichelt, and the most effective arrangement that of Mr. Couzner. Mr. C. Mibus had all his buildings carefully aligned. Mr. Reichelt's principal buildings, constructed of bush timber and iron, were of thoroughly workmanlike design. The eighteen horse stable is of the dome-roofed type open to the east. The horses all face the one way. The stable is 78 ft. x 25 ft., and the contiguous chaff house 42 ft. x 25 ft. The barn was of iron, 55 ft. x 20 ft. It was not of the mouse-proof type. The implement shed, also of iron, was 24 ft. x 60 ft. In addition there were well built cow sheds, smithy, store, and men's hut.

Mr. Couzner's stable furnished an interesting illustration of neat construction in limestone. The limestone spalls were quarried on the property, roughly faced on one side, and grouted in cement. Bricks were used for facing the corners, doors and windows. Buildings of this type are very common in South Australia, but have little vogue here,

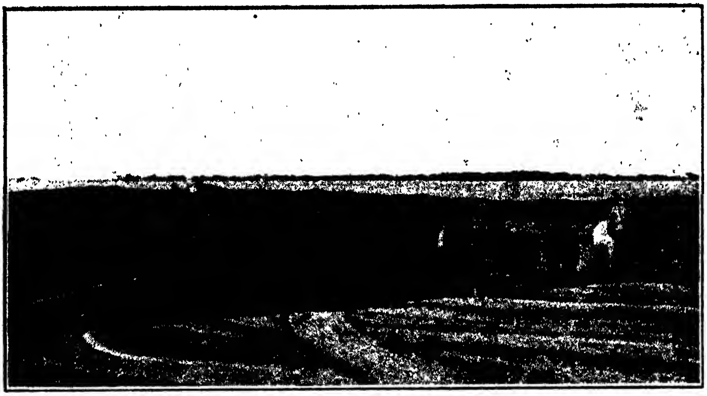
A 6,000-yard Dam of excellent construction, with limestone water-chute (Mr. A. T. Couzner, Beulah).

even in parts of the Mallee where limestone exists in quantity. While at the present time they are no cheaper to construct than wood and iron, their coolness in summer and their more attractive appearance are worthy of consideration.

WATER CONSERVATION.

The well designed public stock and domestic water supply system, the ramifications of which cover the greater part of the Mallee, has done much to render settlement there permanently prosperous, but the extent to which the benefits are enjoyed by the individual farm depends largely upon the enterprise of the farmer himself. On many farms in the Mallee the capacity of the storage provided is still inadequate. Even in a year of normal rainfall, it is not uncommon for all of the dams except the large one at the homestead to dry out in the summer. In drought years, of course, this, too, is almost certain to fail as well, and water carting has to be resorted to. Nothing disorganizes farm routine

so much as water carting. Neither can a garden be maintained, nor an unfailing supply provided for household purposes, without reasonable storages. For a quarter of an acre of garden and for domestic purposes, the main dam should be at least 4,000 to 5,000 cubic yards, though with extreme economy 3,000 yards has sufficed. 10,000 cubic yards is an ideal to be aimed at. With wells or bores, however, there is not the same necessity for large storages, though water from this



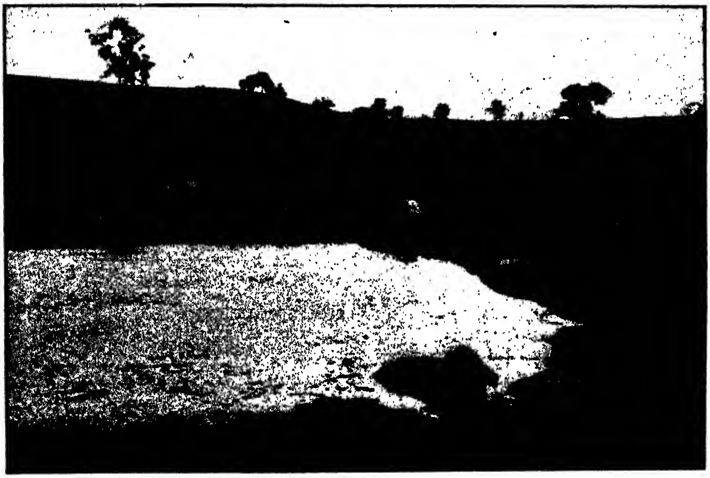
Excavating a 5,000-yard Dam at Messrs. Schulz Bros.', Warracknabeal.

A well-constructed Dam (Messrs. M. E. Schulz and Sons, Warracknabeal).

source is frequently mineralized and hence not entirely suitable for house and garden.

In the paddocks dams of at least 1,000 yards capacity should be aimed at; if less than that they are liable to give out at critical times. An economical method of watering paddocks where it is practicable is to place the dam at the junction of intersecting fence lines. Apart from the capacity of the dams, care should be exercised in their construction.

They should be relatively deep, in order to present the minimum surface to the air, thus reducing evaporation, which is usually from 4 to 5 feet a year. If the excavated dirt is placed regularly round the dam, it acts as a breakwind and helps to further check evaporation. Dams should therefore be at least 12 feet deep, with sides as steep as the scoop horses can negotiate. The dam should either be fenced and mill provided, or a paved stock approach laid. Settling pit and chute of material not subject to erosion by the water are necessary. Chutes may be made of galvanized iron, sacking, but preferably of concrete. Where horses and cattle are permitted access to a dam, or where the corners are allowed to erode, rapid silting occurs. Apart from the



A Death-trap: Sheep caught in the mud in a silted dam.

reduced capacity of the dam, the silt is a death trap to stock when the water gets low.

The following table illustrates the varying storages provided by the competitors. About 10 to 15 cubic yards per acre, even where backed up by bores or wells, appear to be essential for safety and economical working of the farm.

Competitor.	Area of Farm.	Water Stored in Dams.	Source of Permanent Supply.
	acres.		
J. R. Kennedy ..	968	7·1 cub. yds. per ac.	Government channels
A. T. Couzner ..	1 008	11·3 " "	" "
Schneider Bros. ..	1,280	6·3 " "	" "
J. Bryant ..	1,280	6·9 " "	" "
W. T. Fish ...	1,350	8·3 " "	" "
C. F. H. Reichelt*	1,350	11·0 " "	Well, 180 feet deep
Geo. Coutts* ..	1,360	13·0 " "	Well, 88 feet deep
C. A. Mibus ..	2,080	8·1 " "	Government channels
M. E. Schulz & Sons	3,270	6·6 " "	" "

* The well here has been computed as equivalent to dams of 6,000 cubic yards capacity.

On the farms of the majority of the competitors windmills have been installed and a pipe water supply was available at the house, stable and garden. Mr. Geo. Coutts was awarded highest points (21) under this head. The central supply at the homestead is obtained from a well 88 ft. deep of sound construction. The water from this is elevated by a mill to a 5,000 gallon tank on a well made stand. Thence it is distributed by pipes to wash-house, bath-room, garden, and three iron troughs provided with ball stop-cocks. The paddocks are otherwise well watered by means of effectively placed dams and there is a frontage to the Yarrambiac Creek.

Mr. C. F. H. Reichelt was awarded 20 points. In this instance the main supply was also by a well some 180 feet deep. This well was of most approved construction, being timbered with red gum, and provided with a "chamber" and "box". The 12-ft. mill is erected on a

Finishing the Thatch (Mr. J. Bryant's, Beulah).

30-ft. tower. The tank is 4,000 gallon capacity, and is on a stand 10 ft. high.

Mr. A. T. Couzner also gained 20 points. The chief feature of interest was a 6.500 yard dam of good type, well banked, and provided with a chute of limestone and cement. The outlying dams were of large size, and well placed with a view to serving several paddocks.

Messrs. M. E. Schulz and Sons had a number of large dams, either in course of construction or just completed. They were of the best style.

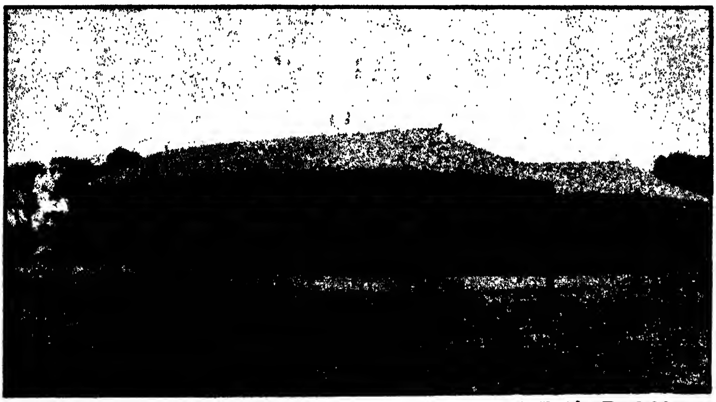
On one farm it was noticed that a number of sheep had perished in the mud in a silted dam in which the water was low.

FODDER RESERVES.

All the competitors had satisfactory reserves of hay which, almost without exception, had been more or less roughly thatched, and which were enclosed with iron with a view to mouse-proofing them. Some competitors had accumulated very large supplies indeed, with the definite objective of turning them over at a big profit during the next drought.

For the most part the hay was of Algerian oats. Where it was wheaten a prevalent fault was the presence of over-ripe grain. Oaten hay grown on fallow was of notably better quality than that cut from the usual stubble sown crops.

The style of stacks built leaves much to be desired, but Mr. W. T. Fish, who has recently arrived in the Mallee from Cobden, set the other competitors a high standard in this respect. His stacks were models of symmetry, and when opened showed practically no wastage because they were stacked with the object of turning water. Mr. Fish remarks with evident truth that it is just as easy to build a good stack as a bad one. He emphasizes the necessity of keeping the stack "well hearted up" from the start; this will give the stack the natural "spring" so well exemplified in all the stacks to be seen on his property, as well as give each sheaf in the stack the downward cant that protects it against penetration by water. In placing down the first layer Mr. Fish works



Well-built and effectively-thatched Stacks (Mr. W. T. Fish's, Beulah).

round the stack say from left to right; he alternates the direction the next layer, and so one until the stack is finished. Sheaves at the edges are placed slightly inside the lower layer, but subsequently are pushed out by the natural spring. Each sheaf is knelt on. On the sloping roof the sheaves are kept fast by deftly engaging portion of the straw of one sheaf with the band of the sheaf lower down.

It was noticed that several of the iron enclosures had been penetrated by mice and also burrowed underneath. In other cases the enclosure had been erected after the stack was built. The iron should be placed in the ground at least 6 in. deep, and care should be taken to tamp the soil well and inspect it occasionally. Where mice had entered the stack the provision of kerosene tins filled with water and placed level with the ground at the corners were noticed to be fairly effective in catching mice.

Mr. W. T. Bryant was awarded 22 marks out of 25 for fodder reserves. He had 400 tons of hay, thatched and mouse-proofed, as well as 100 bushels of oats.

Mr. W. T. Fish had 300 tons of excellent oaten hay and 100 tons of straw. He was awarded 21 marks under this head.

THE FARM HOME.

It is satisfactory to note that public opinion in the Mallee is gradually casting aside the old tradition that it is a place where the physical discomforts are so great that they can be endured only for the purpose of making a fortune sufficiently large to enable an eventual retirement to be made to a more pleasant locality.

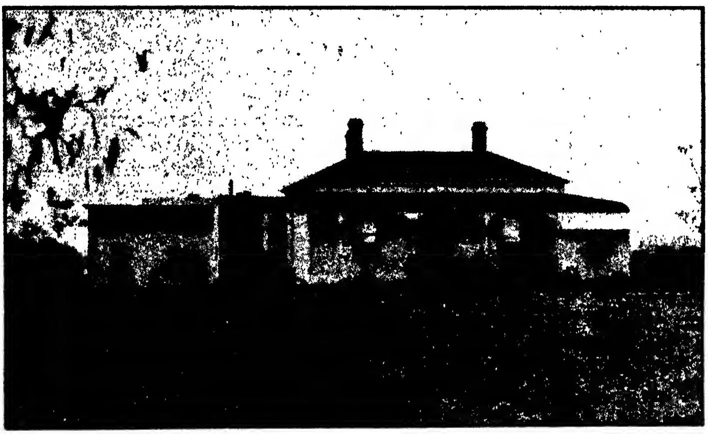
To-day it is recognised that this idea sprang from the primitive conditions which limited capital forced the early pioneers to endure, and further that it disappears when attempts are made to improve the farm environment and the general comforts and convenience of farm home life. The influence of improvements of this sort is at last producing a race of Mallee farmers whose instincts are to remain permanently in the district.

Comfortable Mallee Homestead, sheltered by sugar gums (Mr. J. Kennedy's, Beulah).

The reason for the comparatively slow development of local sentiment in this direction is probably due to the many natural obstacles that must be overcome before the farm surroundings can be made attractive, or the farm home rendered comfortable. In the first place the natural mallee scrub left as shelter belts about the farm buildings soon becomes unkempt; then the soil about the homestead is readily churned up by traffic into loose sand, which blows about and becomes deposited about fences, buildings, &c. No garden can be grown unless a piped water supply is available, and young trees need careful attention during the first year or two of growth.

Houses are hot in summer if designed according to southern standards, and easily rendered uncomfortable by dust and flies unless special precautions are taken. Further, sufficient water for domestic purposes will not always be available unless special provision is made for it. Then again there is the isolation of the farm-houses, each separated by a mile or more.

But that these disabilities can be readily overcome has been demonstrated in scores of instances by progressive Mallee farmers who have paid the matter some attention. Almost the whole of the competitors had comfortable homes located in surroundings as pleasant as any in country districts. Mr. C. N. Mibus, of Katyip, near Antwerp, was awarded 23 out of a possible 25 points under this heading. His home is a substantial one, cool, well ventilated, and provided with extensive verandahs with sleeping-out accommodation. Up-to-date conveniences, such as lighting system, telephone, fly-proofing of doors and windows, cool cellar, piped water supply to kitchen, bathroom and washhouse, and laundry have been installed. The house was located in an attractive garden containing well-grown palm trees, ornamental shrubs, roses, &c. Near by was half-an-acre of orchard. It was well set back from the road, and is approached by means of a straight drive, planted with young sugar gums. The drive was flanked on either side by a well-grassed paddock, containing shade trees and bordered by handsome sugar gums. The aspect from the home was good. Near by was a large dam equipped with springboard, and adjacent was a tennis court.



Residence of Mr W. T. Fish, Beulah.

Mr. Geo. Coutts was awarded 22 points. His homestead is situated in a position commanding an extensive view at the head of a planted drive. The rooms were large and airy, and verandah accommodation good. Telephone, piped water supply, and lighting system had been installed. A feature also was an up-to-date sanitary system with water cistern and septic tank, the cost of which, Mr. Coutts stated, had not exceeded £70. Such an expenditure could be met by most well-to-do farmers, and there is no reason why this improvement should not be standard equipment for practically every farm.

Mr. A. T. Couzner was awarded 20 marks. The house was a large one of faced limestone spalls and brick. All modern conveniences were in evidence. The environment could be improved by more extensive tree planting.

INDIVIDUAL PRODUCTION AND THE AVERAGE TEST.

By W. J. Yuill, Dairy Supervisor.

Every advanced system of dairy farming teaches the necessity for knowing each cow as an individual. This is necessary, because of their varying temperaments, and the unequal quantities of food required by different animals and their varying capacity to produce milk of a high butter-fat percentage. Sufficient feeding of approved quality is an essential principle in every system. Successful dairying demands sufficient feeding at all times, and when the requisite feed nutrients are combined with succulence, as provided in abundant clover pasture, ensilage with added concentrates, or similar feeding, a maximum milk flow is assured.

Too many dairy herds are being milked on pastures that are insufficient for store stock (except, perhaps, for a period during the flush of spring grass). Half rations of inferior food are only too common. Any attempt to ascertain the producing capability of a cow, unless she be receiving all the feed she can consume (which should contain those nutrients so essential to milk secretion) is doing her an injustice. It would be just as rational to expect full power from an engine on limited supplies of fuel. Only when a cow is receiving full feed supplies will the scales and milk chart record her real capability. Simple addition of daily milk weights will give the year's milk production and offers no problem. But around the average test many fallacies and errors have grown up.

There are yet to be found many dairymen who do not understand the meaning of the word "test," or the principle of testing milk for butter-fat. "Test" is simply a term meaning percentage of butter-fat in milk. A five-test cow is one giving 5 lbs. of butter-fat in every 100 lbs. of milk produced; likewise a 4.6 test means four and six-tenths lbs. of fat, and so on. The terms "butter-fat" and "butter" are not synonymous—butter-fat being the pure fat of milk, whilst butter is an article consisting of butter-fat, salt, curd, and water in fairly definite proportions—6 lbs. of butter-fat making approximately 7 lbs. of commercial butter.

It is still commonly believed that the test of a cow during her first lactation period, will be the lowest, and is, therefore, no indication of what it will be in later years. Further, that a cow's test varies from year to year, and that the test can be altered at the will of the feeder, *i.e.*, that feeding foods, rich in protein, such as linseed meal, polly meal, bran, and similar foods, will increase the test, and, inversely, that feeding hay or green fodder or grazing pasture grasses will lower it. This statement is sometimes used to explain the high average test of the leading herds in the Government herd test, and also the relatively poor test of many farmers' herds. Again, the statement is often heard that cows test higher in summer, and during mild temperatures, and that the test is lower in winter and during cold and wet conditions.

Of course, there are passing influences which affect the test, such as excitement (sexual or otherwise), sickness, imperfect milking, unduly severe weather conditions, or a drastic change of feeding, but a normal average test soon returns. It is generally admitted that it is impossible to increase and maintain the butter-fat percentage by any known system of feeding. The use of concentrates, together with maintenance of good condition in milking cows, may, to some slight degree, increase the percentage of butter-fat above that yielded by the same herd when dependent on pasture grasses only. But no definite relationship exists between the test of an animal and the feed digested, the test of an animal being part of her individuality, just as much as is her colour or temperament.

A perusal of any annual report of Government herd tests will show that in every herd there are animals whose test varies greatly, and this even after a herd has been heavily culled for years. It will be found that with similar feeding Jerseys, Ayrshires, or Friesians will, on the average, secrete milk of a butter-fat content characteristic of their breed. Feeding will increase the milk yield, but breeding alone (if it be on right lines) will surely increase the average test.

These and other theories are held by many dairymen. In some instances testing is neglected, owing to the apparent instability of the average test. Haphazard testing would appear to prove that a cow may yield milk of a certain test one year, and of quite a different one the following year. Cows have been purchased with a reputed high test, and disappointment has followed at the disparity between the reputed test and that taken after a subsequent calving, possibly the only difference being the stage of lactation at which the tests were made.

The increasing interest indicated by the formation of testing associations in different parts of the State shows that dairy farmers are awakening to the fact that pounds of butter-fat produced per annum, and not an odd test, is the only true indication of merit. Probably greater interest would be shown if it were more generally known that a cow's normal average test is approximately the same from year to year (therefore a low-test cow can never become a high-test cow), and her test can be ascertained during the first milking period. This being so, it follows that a heifer that proves an indifferent milker, with a low test, should be disposed of for beef while still a young cow.

Dairymen are now giving more attention to securing cows with a good test. Increased competition for cows with reputed high tests is a common illustration of this fact. At a recent clearing sale an out-of-season cow was offered, and, although a good typical dairy cow, bids came slowly until it was mentioned that she was a 6 per cent. test. Immediately the price advanced—eventually reaching a good figure—her reputed test being responsible for the increased demand.

A cow yielding 25 lbs. milk of a 6 per cent. test daily will be producing less butter-fat than one secreting 40 lbs. of 4 per cent. milk. In the case quoted the test given may have represented the average normal test for the year, or it may have been far from it.

In taking a sample of milk for any period care must be observed that it is a representative one. The common practice is to take a composite sample from several successive milkings, an equal amount being put into the sample from the smaller weight of usually higher testing evening milk as compared with the morning milk. Generally no allowance is made for the fact that the butter-fat percentage increases with the period of lactation; so much so, that a test taken early in the milking period may differ from one taken late in the year to the extent of 2 per cent. or more. For instance, a cow with a 4 per cent. test early in her lactation may secrete milk yielding 6 per cent. of butter-fat during the latter part of the milking season.

As there are in most herds cows in varying stages of lactation, injustice will be done to newly-calved cows if the test of milk (instead of the production of butter-fat per annum) is the accepted method of comparison. Not only does a cow's test vary from month to month, and from morning to evening, but should a sample be tested from milk drawn at noon, it may also vary.

In the home-milking competition in Queensland last year, the imported cow "Larkspur" yielded as follows under official test:—

		Fat.
16 lbs. of milk at a 4.5 test at the morning milking	..	·65
13 lbs. " " 5.0 " " noon milking	..	·72
16 lbs. " " 5.2 " " evening milking	..	·83
45 lbs of milk		2·20

The composite average for the day was 4.9; the total fat for the day was 2.20 lbs.; 4.9 per cent. of 45 lbs. of milk. All this shows that there is nothing stable about a cow's test, and how unreliable may be the figures so often quoted at sales. In addition, it emphasizes the need of knowing under what conditions the test was taken, for nothing is more certain than that any one test can only represent a short period at about the time the test was made, and may in no way represent the normal average test for the year.

The following monthly tests of a noted cow, tested under official conditions, approximately represents the average cow, and will serve to show how misleading any one test may be:—

Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
4.82	5.20	4.39	4.76	5.51	6.07	5.94	6.39	6.41

This cow's composite average test for the year was 5.32. Her milk production was 10,850 lbs., and 576.91 lbs. of butter-fat, the butter-fat being 5.32 per cent. of the milk.

To secure a composite average test, it is necessary to know the weights of milk and the amount of butter-fat (whether it be for a day or for a year). The definite percentage that the total fat is of the total milk can be the only true test, and this composite average test remains approximately the same from year to year.

Appended are some records of cows tested under departmental herd test conditions for a number of years. They are typical of the average cow, and approximately represent the various breeds. These records chosen at random can be multiplied by any one who will turn up the

back numbers of the September issue of the *Journal of Agriculture,* which contain the annual report of the year's herd test work. The variation between one year and another will be found in most cases to be approximately half of 1 per cent.; it rarely exceeds 1 per cent.:—

Year of Test.	"Daisy" of Springhurst.	Lady Grey V. of St. Albans.	Jessie VI. of Melrose.	Fuchsia of Warrook
1912–13	5·50	..	..	..
1913–14	5·80	5·62	5·67	..
1914–15	5·34	5·61	5·59	..
1915–16	5·23	5·11	5·69	4·46
1916–17	5·39	5·38	5·32	4·16
1917–18	5·54	5·37	5·50	..
1918–19	5·67	..	5·35	4.23
1919–20	5·06	5·43	..	..
1920–21	..	5·60	6·05	4.39
Variation	·74	·51	·73	·30

Year of Test.	Muria of Department of Agriculture.	Bolobek Isabella.	May Queen II. of St. Albans.
1912–13	..	..	..
1913–14	5.00	..	..
1914–15	..	..	..
1915–16	5·74	..	..
1916–17	5·43	..	..
1917–18	5·57	3·63	4·37
1918–19	5·42	3·52	4·59
1919–20	..	3·60	4·75
1920–21	..	3·36	..
Variation	·74	·27	·38

Sufficient evidence is procurable to prove beyond all doubt that the average test remains approximately the same from one year to another, and the only way to secure a correct record of annual production is to weigh daily and test periodically. It is essential to know each cow as an individual. Haphazard testing, and a composite record of two or three days at mid-season, can never be satisfactory, for it may have no relationship to an animal's actual worth. The high producer in spring is often dry when the consistent milker is still doing well. No true estimate of a cow's worth can be ascertained without a record of the annual milk yield and of her composite average test.

Any system of recording is better than absolute apathy. For the man who cannot find time for daily weighings, there are several short cuts which will give sufficiently correct results to enable the dairy farmer to cull his unprofitable cows, and to indicate from which cows he should breed the future members of his herd. One system which

involves a minimum of labour is to weigh the milk one day a month, and to test a composite sample of the night and morning milk, accepting that day's weight of milk and test to represent the period of a month, as in the following illustration:—

Month.	Lbs. of Milk Daily.	Lbs. of Milk for Month.	Test.	Lbs. of Fat for the Month.
July	20 x 31	620	3·4	21·08
August	25 x 31	775	3·5	27·12
September	30 x 30	900	3·3	29·70
October	35 x 31	1,085	3·4	36·89
November	33 x 30	990	3·5	34·65
December	30 x 31	930	4·0	37·20
January	22 x 31	682	4·3	29·32
February	15 x 28	420	4·8	20·16
March	10 x 31	310	5·0	15·50
April	5 x 12	60	5·3	3·18

Lbs. of milk for year, 6,772 ; lbs. of fat for year, 254·8.

The average of the monthly tests will be found to be 4.05. But the true test for the year can only be the percentage that the total fat is of the total milk secreted during that period. In this instance it would be $\frac{254.8 \times 100}{6772} = 3.785$.

The number of milking associations which have been formed during the last two years indicates that dairymen are realizing that odd tests are no longer satisfactory, and that they desire to know the amount of butter-fat each cow is producing annually.

The average production of butter-fat per cow in Victoria is said to be about 160 lbs. There are herds making very little over 100 lbs. of fat per cow, and there are herds making over 400 lbs. per cow. Feeding will account for a great deal of this difference, but culling out the unprofitable cows, and grading up by keeping the heifer calves from the best cows, together with the use of bulls from tested dams, also largely help in the general improvement.

With the reduction in the price of butter-fat, and the higher standard of living, no dairyman can afford to let the years slip by without utilizing one of the many ways of putting each cow in her true position in the herd. No better way of obtaining this information can be suggested than the formation of local testing associations. Where there are, at least, twenty-five or thirty dairy farmers in a district, they should be able to form such an association. It would, of course, be necessary to obtain the service of a competent person to perform the work, but where a number of farmers co-operate the yearly cost to each would be comparatively small.

WEEDS AND THEIR ERADICATION.

(Continued from page 414.)

By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

The Blackberry or Bramble, *Rubus fruticosus*, L., Rosaceæ.

In southern Victoria the Bramble or Blackberry is rapidly becoming one of our worst pests, and, it is already proclaimed under the Thistle Act for the whole State. It is too well known to need any description, both on account of its numerous fruits, and its aggressive and persistent hold on the places where it has been allowed to establish itself.

Unfortunately, on account of its fruitfulness, it is often allowed to grow undisturbed, or until after its fruits have been harvested. In fact it is very largely due to the value some people place on these berries that this plant is now becoming so very widely spread. That the fruit is permitted to ripen gives the blackberry tremendous possibilities of becoming one of our worst pests. The fruit is also eagerly sought after and eaten by many species of birds and animals, with the result that its seeds are being scattered over very wide areas, which were, until recent times, comparatively, if not quite free of it.

The blackberry is an introduction from Europe and Asia, and like most other introductions, has entered this country free from controlling agencies, and, further, its spread is being facilitated by the assistance given to it by introduced birds and animals, as well as by those indigenous to this country. Many birds eject from the mouth indigestible remains of food; this usually consists of the hard parts of insects and seeds of blackberry when the latter is in season. This seed ejectment is one of Nature's methods for seed dispersal over wide areas. Animals also assist in the spread of this plant by feeding on the ripe berries, the seeds of which, after passing through the digestive tract, remain viable.

The blackberry, in addition to its many bad qualities, affords ideal cover for rabbits and other vermin, besides often making the banks of rivers and creeks inaccessible of approach. It is also responsible for the death of sheep. The writer has seen several instances where these animals have lost their lives through becoming hopelessly entangled among the looping brambles, and so dying a miserable death from starvation.

Though the spread of the blackberry bramble to clean areas is mostly due to its seed being carried there, in established clumps its increase is usually due to the long arching or trailing brambles becoming rooted at the tips, and by these means commencing the formation of a fresh clump, which, unless checked, will ultimately become merged into one tangled mass. Fig. 45 gives an example of a typical arched bramble that has fallen over and become rooted at its tip.

Blackberries have a perennial rootstock without underground creeping shoots, and their propagation is usually by the means above mentioned.

One of the first steps towards blackberry control should be to prevent this plant from fruiting wherever possible. This could be accomplished either by cutting down the brambles, burning them, or by spraying the bushes with chemicals.

On cultivable land there need not be such very great difficulty in blackberry eradication. If the clumps or masses are old established, these should first be cut round by means of a horse-drawn mowing machine, or else cut with a slasher. The cut material should then be thrown back on to the mass of uncut brambles and left until fairly dry. Some free-burning material, such as bushes or straw, should be added so as to insure a good burn. If the burn is not a good one by reason of insufficient material, the brambles are merely scorched and toughened, and are then more difficult to cut than they were previous to being fired. If there has been a good clean burn, the roots can be completely dug out and burnt, or the land can be ploughed during the warm weather, and often enough to prevent any new shoots arising, and thus feeding any rootstocks remaining in the ground.

Repeated cutting of new shoots will starve the rootstocks, ultimately killing them, but cutting to be effective must be frequent and thorough,

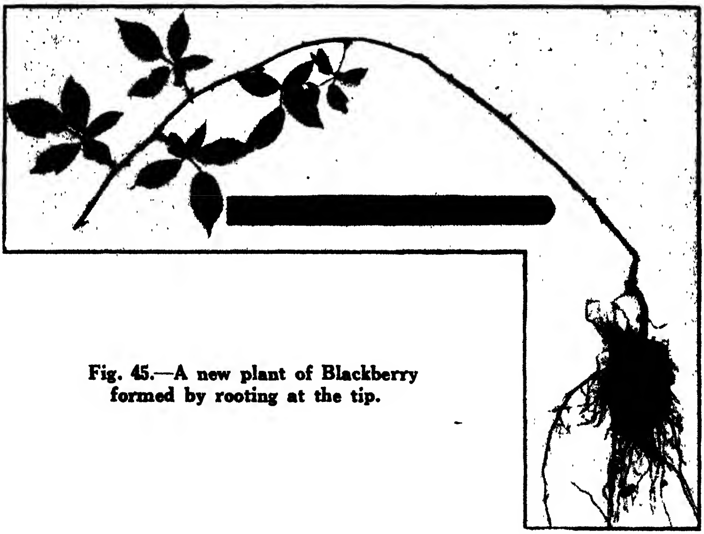


Fig. 45.—A new plant of Blackberry formed by rooting at the tip.

the chief aim being to prevent leaf formation, and thus starving the roots.

The great difficulty with blackberry control is when this plant is growing on land of a rocky or stony nature or on creek or river frontages, or in situations that make cultivation either impracticable or undesirable on account of the danger of soil erosion during floods. In such places, cutting to prevent fruiting will control the plant without eradicating it, usually two cuttings a year being sufficient to stop its further spread.

This is unsatisfactory, because the work has to be repeated year after year; it is cheaper to kill the roots and have done with them, and for this purpose chemicals could be employed. If an arsenical preparation is used, the brambles should first be cut and burnt as already described, otherwise, if the bushes are sprayed with arsenic

without previous cutting and burning, the leaves drop off, leaving a jungle of loose canes that make their removal difficult afterwards, either by fire or by cutting.

If a clean burn has been obtained, the shoots that will afterwards spring up can be easily destroyed by the arsenical spray every time they make their appearance. There are at the present time on the market some excellent preparations of arsenic of great solubility, that should do away with the necessity for using the home-made preparations, but for those preferring to prepare their own arsenical sprays. the following mixture can be recommended as having given good results against blackberries:—

Boil together 1 lb. white arsenic, 2 lbs. washing soda, and 2 gallons water. When dissolving use a slow fire, only allowing the mixture to simmer; if the solution is boiled rapidly, there is a risk of the material

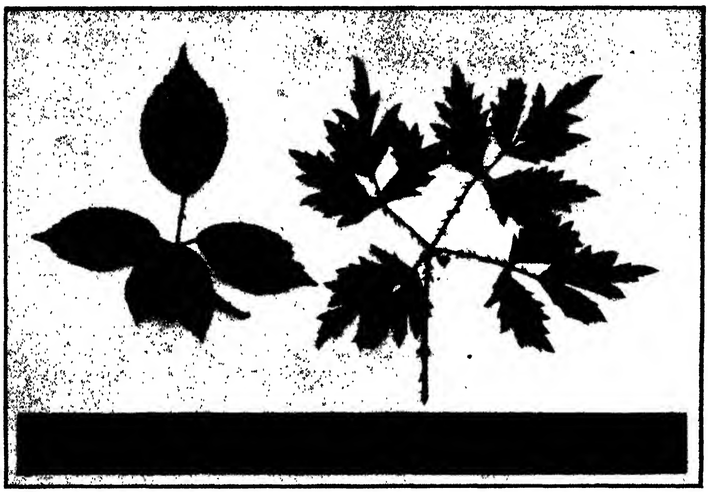


Fig. 46. Leaf of Common Blackberry and of Cut-leaved Blackberry.

boiling over. The liquid should become clear in about 30 minutes; then make it up to 10 gallons.

It is not advisable to make a concentrated stock of dissolved arsenic, as in all probab'lity it will crystallize on becoming cold necessitating it all being boiled over again

In spraying with arsenical mixtures, one should stand with his back to the wind, so that the material will be carried away from the operator.

As arsenical preparations are exceedingly poisonous, stock should always be removed from land being treated with this chemical.

When large masses of blackberries are growing on banks of watercourses (one of the plant's favourite places), it is not always advisable to use arsenical preparations. In such situations, as many of the canes as can be reached should be sprayed with crude petroleum during the summer months, and then the outside masses should be slashed down and the lot burnt. Shoots arising later could be again

sprayed with this oil, or salt might be liberally applied to the crowns of plants during hot dry weather.

The application of caustic soda has been recommended against blackberries, 1 lb. caustic soda being used to 2 gallons water and applied by means of a watering-can, further applications to be made when new growths appear.

A small mob of goats can be most effectually employed against blackberries. Their smooth hair allows them to poke about among the brambles in search of the leaves without any danger of becoming entangled, as sheep would under similar conditions, and if all the leaves are kept eaten off the plants will soon be completely killed. The results would be much quicker if the top hamper of brambles were first removed by means of fire, and the goats then allowed to deal with the young shoots when these made an appearance.

Some very large patches of blackberry bushes have been completely destroyed by a small mob of goats in the north-east of Victoria.

The Cut-leaved Blackberry, *Rubus laciniatus*, Willd.

This bramble, which often goes by the name of Italian blackberry, though its country of origin appears to be uncertain, is becoming very widely spread. It has already a very bad reputation, and should be destroyed wherever it is possible to do so.

The same methods of eradication recommended for the common blackberry should be used against this species. Fig. 46 shows leaves of both species of blackberries; that on the left is the common blackberry, while that on the right is the cut-leaved blackberry.

(To be continued.)

MINERALS FOR PIGS.

If a pig be left to its own devices, and given a certain amount of liberty and access to a variety of feed, it will balance its own ration. No domestic animal possesses the instinct of knowing what its system requires better than the pig, and the same claim can be made respecting the craving for mineral matter, which is not so manifest in any other farm animals. Should the requisite amount of mineral substance needed for the normal growth of the animal be not supplied in its feed, the pig will, if given range enough, find in the earth that which it needs. Any one who has had anything to do with pigs must have noticed this strong desire for mineral substances, particularly in the case of growing animals and breeding sows. Mineral in the natural state as is found in the ground or in the form of inorganic salts in burnt wood, bones and vegetation, is essential to a pig, and is utilized not only for the formation of a skeleton but in the case of brood sows is necessary for the development of the unborn young. Indeed, a certain amount of mineral matter during pregnancy is essential for health and strong litters. This fact should never be lost sight of by breeders.—*Industrial and Mining Standard*, 22.6.22.

CASSE.

Wine Defects not directly caused by Micro-Organisms.

(Continued from page 431.)

By F. de Castella, Government Viticulturist.

Blue, Black, or Ferric Casse.*

Blue casse differs radically from the brown form in its nature, in its symptoms, and in its treatment.

The only points in common are that both occur on exposure to air, and that neither is caused by bacteria.

Blue casse is merely due to an excess of iron in the wine. All wines contain iron, but in very small quantity, the normal content being in the neighbourhood of 1 centigramme per litre (1 part per 100,000).† When this proportion is exceeded, trouble is likely to occur on exposure of the wine to air. The iron present in the wine is combined with its different acids in the form of tartrates, malates, citrates, tannates, &c. There are two series of salts of iron, viz., ferrous and ferric, the former containing less oxygen than the latter. On exposure to air, the ferrous salts are oxydized to the ferric form, which, acting on the tannin, form ferric tannate, or ink, hence the blue or black colour.

The exact state in which these substances are present is far from simple. A complex balance seems to establish itself between the iron combined with the acids of the wine and that capable of forming tannates. On this balance being disturbed the blue colour may appear. Hence the occasionally disappointing results of tannin addition, which sometimes makes condition worse instead of improving it.

Blue casse is most noticeable in white wine, though it may also occur in red, in which case, being masked by the colour of the wine, it may be mistaken for the brown form. In red wine the case is more complicated, as will be shown presently: The simpler case of white wine, with its more typical and striking manifestations can appropriately be considered first. The wine remains clear until exposed to air; after a racking, which aerates it, it becomes cloudy, first taking on a dull leaden colour, which may even be bluish-black, as though a few drops of ink had been added. The cloud ultimately settles in the lees, but sometimes it takes a long time to do so. After settlement, the lees are found on analysis to be rich in iron, whilst the wine contains less iron and tannin than previously. Most of us are only too familiar with white wines in bottles, which, though bright and of attractive colour before the cork is drawn, become dull and leaden looking a day, or even a few hours, after being decanted. This is perhaps the best known and most annoying form.

HOW DOES IRON GET INTO WINE ?

In the special case of Jacquez the high iron content is peculiar to the grape. In other wines iron is more often introduced accidentally.

* Some writers use the term "black," especially when white wines are affected, reserving the term "blue" for changes of the same nature in red wine.

† See Appendix, page

Our forefathers were wise in avoiding the use of metals in their cellars, and only allowing grapes or wine to come in contact with wooden vessels and implements, and bare hands and feet.

In our wineries iron is everywhere. Presses, stemmers, coolers, &c., are mainly made of iron. It is true that this becomes more or less protected by the formation of a black coating; but I think we would be wise in substituting bronze or gun-metal for iron wherever possible. One centigramme per litre added to the iron content of a normal wine is sufficient to cause trouble—in other words, 42 grains per hogshead. A 3-in. wire nail weighs over 80 grains (82½, to be accurate). The ubiquitous kerosene tin, into which our grapes are usually picked, is no doubt responsible for much iron in the wine. Rust is more easily dissolved than metallic iron. It would be well to paint tins inside with some non-poisonous paint, or even well-boiled coal-tar. The kerosene tin, unless new and bright, is a poor cellar utensil.

Though very undesirable in a wine, iron is not unwholesome. In this it differs from zinc, which is a poison. Galvanized iron receptacles, &c., should be absolutely banished from the cellar, since the zinc coating is rapidly attacked by wine. Lead is even worse. Brass, so often used for taps, &c., being an alloy of zinc and copper, is much attacked and therefore undesirable. Bronze or gunmetal (tin and copper) and block tin are the safest metals for cellar use. Copper is not attacked so long as the red metal surface is clean and bright. The dull coat of oxide which soon forms is, however, rapidly attacked.

Our soils contain much iron, usually over 3 per cent. A little mud or earth crushed with the grapes may easily double the normal content of 1 centigramme per litre.

Cement vats are also a source of iron, since cement contains much of this metal. Unless cement vats are carefully paraffined, wine fermented or stored in them may easily dissolve iron in undesirable quantity.

Mathieu* recommends painting all ironwork with which grapes or must come in contact with a varnish, consisting simply of shellac dissolved in alcohol, easily applied with a brush. "It dries rapidly, forming a hard coating which is very adherent if the surface to be painted was well cleaned, the metal being laid bare and free from rust." After vintage the few spots where the varnish has worn off can easily be re-coated. Such patches must first be thoroughly washed and quite dry. "Every cellar where iron machinery is in use should have its pot of shellac varnish, as indispensible as a shifting spanner."

Blue Casse of Red Wine.

Aeration precipitates ferric tannate in a red wine containing much iron, just as it does in a white wine, but the blue tint is less noticeable, being masked by the colour of the wine. Red wines are, as a matter of fact, even more liable than white, owing to their much higher tannin content. The problem is further complicated by the fact that red wine contains two different tannins, viz., œnotannin, as in white wine, though in larger proportions, and the red coloring matter, which is itself a tannoid or tannin-like substance.

The earlier investigations of blue casse were, indeed, in connexion with a red wine—that made from Jacquez,† which is full-bodied and

* *R. Vit.*, LV., 231, 29 Sept., 1921.

† Jacquez (called Lenoir in U.S.A.), a direct producer, at one time largely grown in France, where it was also used as a stock. It is still so used at the Cape, mainly for Gardo Blanco.

poor in acid, but of intense though unstable colour. Its well-known predisposition to casse (blue) is due to this peculiarity, and also to its being rich in iron. In order to make Jacquez wine of stable colour, it was found necessary to increase the acidity (tartaric) to 12‰, whereas 10‰ suffices for the Bouschet Hybrids and 8‰ for ordinary South of France varieties, such as Aramon, Carignane, &c.*

So long ago as 1887 Bouffard published a monograph on the making of wine from Jacquez in which he described the mechanism of blue casse, which also affects many other wines. He showed how air is necessary to cause the wine to turn blue; that the blue sediment, insoluble in water, is soluble in tartaric acid; that on calcination this sediment leaves 10% of its weight of iron sesquioxyde, which, transformed into a ferric salt and added to wine, causes an intense blue precipitate. He concluded, "that there exists in the wine a ferrous œnolate,† which on oxydation by air, passes to the state of blue ferric œnolate and is precipitated.

In a later article on casse,‡ Bouffard attributes blue casse to the formation of a compound of colouring matter (acide œnolique) and iron oxide. He recalls how A. Gautier long since pointed out the existence of a blue black ferric œnolate, also the fact, known to cellarmen, that wine, left for a time in an iron vessel, throws, on exposure to air, a bluish sediment.

He further pointed out the uselessness of pasteurization for blue casse, and how, in view of the striking difference between the brown and the blue forms, there was no excuse for the confusion at that time very prevalent between the two. He recalls how, in 1887, in connexion with Jacquez wine, he had recommended copious aeration, to provoke sedimentation of oxidisible matter as the first stage of treatment. In his later article he gives preference to citric acid treatment and looks upon excessive aeration as somewhat dangerous and prejudical to bouquet owing to its "flattening" effect.

Though we do not grow Jacquez, blue casse of red wine presents, in the writer's opinion, considerable interest in Australia. It is highly probable that much of the condition trouble of our fuller bodied red wines is due to this cause; many of these wines, like that made from Jacquez, are dark in colour and poor in acid. If, in addition, they should contain an excess of iron, either naturally or accidentally, the blue precipitate will surely form on exposure to air. The somewhat lighter colour and body, often noted in Australian wines bottled in London, as compared with the type of wine shipped from Australia, is no doubt mainly due to the elimination of much colouring matter and tannin, &c., which are rendered insoluble during the shaking the wine receives on shipboard. The powerful ageing effect of a sea voyage on wine has long been known.

Laborde, in an exhaustive article on the tannoid matters of wine, refers at some length to blue casse of red wine. The following extracts are of interest:—

With red wines the slight colour changes, resulting in a bluish and dull appearance, followed by a more or less marked lack of clearness, are known as *blue casse.* It was first remarked in the wine of a special vine variety, viz., Jacquez.

In contact with air the normal colour becomes more and more violet and dull; if the surface remains quite still an extremely thin irridescent film may be observed: a blue black precipitate then forms and settles down, but the quantity of tannoid substances which become insoluble is never very considerable even if aeration be somewhat exaggerated. Similar changes are not rare for other varieties; they are more frequent in wine yielded by young vines, and in certain seasons or soils.

* Roos' "Wine Making in Hot Climates," pp. 54 and 221, translated by Dubois and Wilkinson.
† *R. Vit.*, XV., 37 ;, &c., 6th April, 1901.
‡ Oenolic Acid is a term at one time freely used to designate the tannin of wine.

Spontaneous return to limpidity follows complete sedimentation of the precipitate after a variable time, according to the intensity of aeration and the nature of the wine. If aeration was sufficient the colour of the wine has then lost its earlier sensitiveness. . . . .

The richness of the wine in iron seems to be connected with the colour change; this is confirmed by the action of citric acid, which is, *for equality of weight, twice as active as tartaric for prevention of blue casse*, and which, therefore constitutes a chemical antidote against the precipitation of iron. The addition of tartaric, or, better still, citric acid keeps the iron sesquioxyde in solution, thus preventing its combination, in insoluble form, with tannoid substances. Blue casse would thus have for cause, an unstable equilibrium between the acidity of the wine and its iron content, the first being too low in proportion to the second.

The question is much less simple than would appear at first sight; wines occasionally behaving in quite unexpected ways. Laborde quotes cases where precipitation occurred on exposure to air, though the iron content was but little above normal (1.5 to 1.8 cgms.). In most cases tannoids were precipitated in much greater proportion than iron. He concludes, " That the precipitate is not a definite compound of iron and tannin . . . . but a complex mixture, containing, in addition to tannoids and iron, nitrogenous organic matters and mineral substances such as phosphoric acid, lime, &c., thrown down owing to the colloid nature of the precipitate, the basis of which is colouring matter and œnotannin."

He attaches considerable importance to the loose combination which seems to exist between potash and tannoids, especially colouring matter, and recalls Martinand's *Potassic Casse*, referred to below and which is probably more common in Australian wines than is realized. He mentions two wines of Claret type, similar in composition, except that one contained more œnotannin than colour, whilst the other, on the contrary, contained more colour than œnotannin. The first was stable on aeration, the second was liable to casse. However, after moderate aeration followed by fining and the addition of 50 cgms. of citric acid, it was completely cured and had lost half its original iron contents.

It is thus evident that definite values cannot be assigned to the parts played by iron and tannoids, and that it is exceedingly difficult to fix an iron limit beyond which casse must be reckoned with. The air test gives the most reliable information, and is of very simple application.

Treatment of Blue Casse.

Whether in white or red wine the treatment is the same; it differs radically from that of brown or oxydasic casse, the precipitate of ferric tannate being promoted by active aeration.

Pasteurization is quite useless, since it has no effect on the iron contained in the wine, at least, no permanent effect. It is true that the cloud resulting from exposure to air, redissolves on heating, but only temporarily, it appears again after cooling. A wine pasteurized at 100° C. (boiling point) is just as liable to cloud as it was before treatment. Nor is the addition of SO_2 satisfactory. It certainly prevents the formation of ferric tannate, owing to its avidity for oxygen, but the protection is only temporary. When the SO_2 is oxidized or combined, the liability to blue casse returns.

Ferric tannate is soluble in tartaric and citric acids, and in the case of wine which is only slightly dull, the addition of a small quantity ($\frac{1}{2}$ to 1 gramme per litre) of either acid will effect a marked improvement. We have seen how increasing the acidity was recommended so long ago as 1846. It should be remembered that, owing to complex reactions, the addition of tartaric acid to a wine only increases the total acidity by about two-thirds of the quantity added. With citric acid the increase is equal to the added acid. See p. (489). Citric acid is

usually considered more effective than tartaric; twice as effective according to Laborde, whilst other writers go even further.

Addition of acid, however, merely redissolves the cloud, it does not remove any of the iron. A much more logical treatment is aeration, which causes part, at least, of the iron to be thrown out of solution. If the wine be poor in tannin, a little should be added, say, half an ounce to an ounce per 100 gallons, and the wine energetically aerated. A bicycle pump connected with a $\frac{1}{4}$-in. copper tube closed at the end and drilled with a few very small holes will be found most convenient. Ferric tannate will be formed, putting the wine into shocking condition; but this is only temporary. The precipitate will eventually fall into the lees, leaving the wine bright and reduced in iron content. It must be remembered that aeration is severe on some wines, especially on light delicate ones, unduly ageing them and reducing bouquet. Wines can, therefore, be best treated in this way when quite young. After aeration, the wine should be fined or filtered, and when bright the addition of 2 or 3 oz. of tartaric or $1\frac{1}{2}$ to 2 oz. of citric acid per 100 gallons will prevent a return of the trouble.

In order to ascertain whether or not the wine is liable to blue casse, the air test is applied, just as was described previously, the simple test with a half-filled glass covered with a card being usually sufficient. Care must be taken that the wine does not contain too much of either carbonic or sulphurous acid, which would protect the ferrous tannate from air, and prevent the formation of a cloud, thus rendering the test misleading. Aeration with a bicycle pump for a few minutes will drive off these acids.

An ingenious method of what might be termed super-aeration, recently recommended in France,* consists in forcing gaseous oxygen from an ordinary steel cylinder, delivered through a reducing valve at a pressure of 4 kilos (57 lbs. per square inch) into the porous porcelain candle of a chamberlain filter submerged in the wine. The gas escaping in very minute bubbles forms what almost amounts to an emulsion, thus giving intimate contact and rapid and active oxygenation.

Ferrous salts are thus oxidized and pass to the ferric state. Insoluble ferric tannates are formed and precipitated together with coagulated albumen and gelatine. These last remain in solution when the iron is in ferrous form; in the language of cellarmen "the wine will not take the finings." After oxidation, striking results are recorded, a wine containing 16 cgms. iron turned inky black—fined four days later with gelatine, greyish flakes formed, easily removed by filtration, leaving the wine bright. On analysis it was found to have lost three-quarters of its original iron content.

Similar treatment of red wines liable to blue casse resulted in a like decrease in iron content. After filtration these wines were brilliant, of a fine ruby colour and perfectly stable.

In a later communication,† the same authors describe similar experiments with musts, in connexion with the making of white wine from red grapes—the active oxygenation destroyed most of the colour which it was desired to eliminate. They quote Zenghelis (C.R. Vol. 170, 1920, p. 883), who showed that gases, finely divided by passage through a

* Piedallu, Malvezin, and Grandchamp. Communication to the Académie des Sciences, 10th May, 1920.

† January, 1921.

porous membrane, act as though in nascent form, their action being thus considerably increased. . . . . Oxygenation can also be obtained by the addition of hydrogen peroxyde, but its effect on the wine is too drastic and brutal; it is also prohibited by French pure wine laws. It was these facts which led to the trial of oxygen in fine bubbles, as described above. It is to be regretted that the quantity of oxygen used is not stated; it does not, however, appear to be considerable.

The filter candle could probably be used with advantage in ordinary aeration, of which it should greatly enhance the efficacy. It should be remembered that air contains one-fifth of its bulk of pure oxygen.

Obviously the smaller the bubbles the greater the surface of contact. Forcing air under pressure through a few small apertures will aerate much more effectually than the large bubbles from a cellar pump working empty. The minute bubbles from the filter candle will, of course, be still more effectual, whether the oxygenating agent be air or pure oxygen.

Pacottet* describes a wine trouble sometimes occurring in very cold weather which might be mistaken for blue casse. It is due to a cloud so fine as to be almost invisible, yet sufficient to split up light, only permitting the passage of blue rays. It may be so fine as to be unaffected by fining or filtration, and to settle very slowly. Such a cloud may be artificially produced by adding to a wine mere traces of gelatine and tannin.

How to Distinguish Between Brown and Blue Casse.

Seeing that the treatments for these two forms differ so widely, and that in certain cases it is not so easy as might be thought to distinguish between them, the following hints may be of use.

Take a clear glass bottle, half-filled with the wine, shake and plug with cotton wool. If no cloud forms after a couple of days, the wine is not liable to any form of casse. Should a cloud appear, add a crystal of citric acid the size of a pea; shake until dissolved. If after a few hours the wine again becomes bright, it indicates blue casse.

Take another sample of the wine which clouds on exposure to air and fill a strong pint bottle with it; tie the cork securely and heat to boiling in a water bath. When cold, draw the cork; half-fill a clear glass bottle with the heated wine and plug with cotton wool as before. Should this wine become cloudy after a day or two, it is a case of blue casse; if it remains bright, of brown casse.

White Casse.

This is characterized by a milky white cloud which occurs, as in other forms of casse, on exposure to air. It is most frequent in white wine, especially in those containing much free tartaric acid; red wines may also be affected, but they are much less liable, and the characteristic white cloud is masked by the colour of the wine. White wines thus affected are troublesome to handle, the cloud being light and slow in settling. Notwithstanding the marked difference in the outward appearance this form is closely related to blue casse, since it results from the presence of an excessive proportion of iron in the wine. In this case, however, the surplus iron is combined with phosphoric acid and not with tannin as in blue casse. In addition to iron and phosphoric

* *Vinification*, p. 264.

acid, lime seems to play an important part. Pacottet connects white casse with the use of cement vats, the surface of which is insufficiently protected from attack by the wine. The standard treatment consists in the addition of citric acid; tartaric acid is of little or no use.

White casse was first mentioned by Bouffard in 1901, in an article on different forms of casse. He pointed out that a new form should be added to the list, viz., white casse of more obscure origin than the other forms, but which yields to the specific action of citric acid.

The milky opalescent cloud and whitish sediment are the consequence of oxidation by air, in spite of pasteurization, sulphurous acid, and even tartaric acid. The colour of the wine does not seem to play a part. The sediment, consisting of oxidized substances, seems to contain lime, perhaps iron. Citric acid alone prevents its production.

With intuition similar to that shown in connexion with brown casse, Bouffard again indicated the cure before the nature of white casse was understood. It is to Laborde,* however, that we owe the complete explanation of the disorder.

In addition to blue casse, air often provokes, in white wine, a milky cloud, as a rule very slow in settling, and which constitutes Bouffard's white casse. . . . Sulphurous acid is without action, tartaric acid almost equally so; citric acid alone attenuates the effects of aeration, thus indicating that, as in blue casse, iron is not foreign to the phenomenon. . . . Iron is not, however, the most important constituent of the very complex precipitate. . . . Organic substances usually predominate, besides some phosphoric acid and lime.

Experiments are described with artificial liquids of similar composition to wine, in which the proportion of any constituent could be varied at will. In such, the addition of iron, in ferrous form (4 or 5 cgms. of sulphate), followed by aeration, caused a cloud identical with that of white casse, even in the absence of tannin, thus proving its formation to be independent of this substance.

He further describes how an aqueous solution of phosphoric acid (1 gramme per litre) to which 4 or 5 grammes of cream of tartar are added, remains limpid. Nor does the introduction of a ferrous salt bring about any immediate change. On aeration, however, it soon becomes opalescent, and ultimately a cloud forms. These changes can be immediately brought about by adding hydrogen peroxyde or by substituting a ferric for the ferrous salt.

He thus sums up the changes responsible for white casse in wine:—"On contact with air the iron contained by the wine in the form of ferrous salts passes to the ferric state. Peroxyde of iron forms with the phosphoric acid, that is a mineral constituent of wine, an insoluble iron phosphate which is precipitated, carrying down with it tannin, proteic and mucilaginous substances, lime, &c.

The cloud of white casse can be induced in many stable white wines by adding a small quantity of a ferrous salt. . . . These reactions depend also on a state of equilibrium variable according to the composition of the medium. It has been shown that the accidental introduction of iron can also bring about black casse; we have thus a case of the same cause producing different effects in consequence of differences in the constitution of the medium.

On studying these differences one finds that black (blue) casse occurs in wine containing little or no free tartaric acid, and white casse under contrary conditions. In the first case the greenish-black ferric tannate can form at the same time as the colourless phosphate, whereas in the second the free tartaric acid prevents the existence of tannate without interfering with the precipitation of ferric phosphate. He goes on to show that white casse is more frequent in vintages when the grapes do not ripen properly, and that the use of new cement vats, or any other cause unduly increasing the iron content of the wine, renders wine liable to white casse.

White casse may occur in red wine, in which case its character is altered, owing to the colouring matter of the wine, part of which is

* J. Laborde, "Etude Sur Les Matières Tannoides Du Vin," *R. Vit.*, numerous articles from August, 1908, to March, 1910.

deposited with the ferric phosphate. In Laborde's opinion, red wines are much less liable than white, since they are seldom rich in free tartaric acid.

In this case it would still be a blue casse, because the precipitate of ferric phosphate would carry colouring matter down with it. As a rule, the blue-black sediment of red wines, liable to blue casse, only contains traces of phosphoric acid.

In a communication to the Academie des Sciences on 5th March, 1917, Laborde resumes his earlier experiments, and adds the result of more recent observation to the effect that "SO_2, like tartaric acid, converts black casse into white casse; this last can occur even in presence of free sulphurous acid. Furthermore, citric acid, used even preventively at the legal dose of 50 cgms., does not always entirely prevent the effects of aeration, but it generally favours the coagulation of the whitish cloud.

Thus, the rational treatment of white casse in wine containing free SO_2, would consist in first bringing about the cloud by aerating sufficiently, adding citric acid, and finally clarifying, after a few weeks' rest, by fining or filtration.

It will be noted that this treatment is practically the same as that of blue casse.

Fouzes Diacon, of Montpellier, has also investigated white casse, the conclusions he arrives at are in accord with those of Laborde. The following are extracts from a communication to the Academie des Sciences*:—

The whitish sediment, which is greyish-white after drying, contains organic matter and mineral elements; lime is present in very small quantity, the proportion of iron is more considerable, it is combined with phosphoric acid as basic ferric phosphate $(P_2O_5)2Fe_2O_3$, soluble in citric acid, as has been pointed out by Moissan.

Fouzes Diacon differs somewhat from Laborde concerning the action of SO_2, holding that it is only after its oxidation that the cloud forms on aeration. The medium being no longer a reducing one, the air acts on the ferrous compound present in the wine, precipitating it in the shape of basic ferric phosphate combined with lime and organic matter. Lime is indispensable. . . . if this be eliminated the wine no longer clouds on aeration; but the proportion of lime naturally present in white wines is always sufficient for it to occur. Excess of iron and phosphoric acid are equally indispensable; this form of casse can be caused in a sound white wine by the addition of small quantities of ferrous sulphate and ammonium phosphate followed by exidation, by passing air through it or by hydrogen peroxyde.

He sees one of the chief causes of this disorder in the extensive use in Southern France of sulphurous solutions of ammonium phosphate. The white wines in which it most frequently occurs are much exposed to contact with iron in their treatment in the winery.

White casse, though interesting, is probably much less frequent in Australian wines than the blue form, owing to their low acidity, as compared with French wines. In the cooler districts, however, especially in seasons when the grapes do not ripen thoroughly, it may have to be reckoned with.

Citric Acid.

The use of this acid has been referred to several times in the foregoing pages. A few remarks concerning the legality of its addition to wine and the doses in which it may be employed will, therefore, not be out of place.

The pure wine laws of Victoria and the other States of the Commonwealth do not specifically mention citric acid; its use is, nevertheless, legal in Victoria, since the Health Act of 6th January, 1920, sec. 218(*b*)

* *C. R.*, 22nd January, 1917.

(IV.), includes among the permitted additions "natural products of grape vine leaves or flowers." Citric acid is a normal constituent of vine leaves.

Most European wine laws permit the use of this acid. In France, prior to 1908, it was not definitely permitted. Though not listed as a prohibited substance, in view of the severity of French pure wine legislation, its addition was attended with some risk. Nevertheless, its value as a substitute for tartaric acid to increase deficient acidity and its greater potency in improving the "condition" of certain wines had long been recognised. Early in 1908 its use was definitely authorized in proportion not exceeding 50 centigrammes per litre (8 oz. av. per 100 gallons).*

Prior to this the risk, or perhaps, more correctly, the doubt as to the legality of its use, was the cause of considerable inconvenience, more particularly to the sparkling wine industry, which had long since found the addition of small quantities of citric acid to be quite indispensable for the avoidance of some of the condition troubles described above.

This legalization of citric acid was a great boon to cellar managers; from a health stand-point no exception can be taken to its use, since it is quite as wholesome as tartaric acid; furthermore, it is not foreign to the grape, but a normal constituent, though usually present in small proportion, it may in certain cases be fairly plentiful.

The existence of citric acid in the grape has long been admitted, but it was usually thought to be only occasionally present and in minute quantity. More recent investigations show that it exists in most grapes in larger quantities than was formerly thought. Dupont† in 1908 examined a collection of southern French wines of vin ordinaire type; he found the citric acid content to be, as a rule, not less than 10 cgms., whilst in some cases it was as high as 50 cgms., sulphited wines usually containing a higher proportion than those not so treated, owing to protection from acid-consuming organisms during fermentation.

The question was further investigated, at the request of the Bordeaux Chamber of Commerce, by Blarez, Denigès, and Gayon in 1914. The wines examined were mainly from the Sauternes district, but samples were included from Montbazillac, Anjou, and the Rhine. Most of these contained citric acid in quantities varying from 5 to 30 cgms.; a sauternes of 1906 vintage contained no less than 45 cgms.

Fresh grapes (from Sauternes) were also examined; the citric content varied from 10 cgms. for sound grapes to 65 cgms. in the case of grapes much affected by *Botrytis cinerea* (noble rot).

Citric acid has a characteristic sharp taste, the taste of lemon juice in fact, which is noticeable if added to the wine in any quantity. For this reason the fixing of a legal limit seems scarcely necessary. Considerably less than the 50 cgms. allowed in France gives most wines an excessive and disagreeable acidity.

The molecular weight of citric acid (67) being lower than that of tartaric (75), a smaller quantity is necessary to effect a given increase in acidity. In other words, 67 lbs. of citric will go as far as 75 of tartaric.

Apart from this difference in molecular weights, however, the two acids behave very differently when added to wine. Owing to complex reactions, resulting chiefly in the decomposition of bi-malates and the

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* See circular of M. Roux, Chief of the Service for the Repression of Fraud, of 13th May, 1908, issued on the advice of the Commercial Commission and of the Permanent Technical Commission of the French Customs. This circular sets forth that the addition to wine of pure citric acid, in proportion not exceeding 50 grammes per hectolitre (50 cgms.), is not to be considered contrary to Art. 2 of the Decree of 1907.

† *R. Vit.*, XXX., pp. 173 and 203.

precipitation of part of the added acid as cream of tartar, tartaric acid only increases the total acidity, by a portion of the acid which is added. The exact increase varies somewhat according to circumstances, but is usually admitted to be about 70% of the added acid for quantities up to 4 grms. per litre (4‰).

Citric acid, on the other hand, causes no saline precipitate to form—the increase in acidity is equal to the weight of added acid, after making allowance for the difference in atomic weights already referred to.

The two acids vary again very considerably as regards the efficacy of their action on blue casse, citric acid being much more powerful in this direction. As to how much more so, authorities differ. Laborde holds citric acid to be twice as effectual as tartaric. Gouin* goes much further, considering it to be ten times as active.

Though a most valuable help to the cellarman, more particularly in certain troubles described above, citric acid must be used with discretion, and at the minimum dose necessary to attain the desired result. It must be remembered that Australian wines are in demand by customers who usually dislike wines of high acidity. Such small additions as an ounce to the 100 gallons (one-eighth the French legal limit) often effect marked improvement in the condition of a troublesome wine.

Appendix.

TABLE SHOWING THE CORRESPONDENCE OF SOME METRIC AND ENGLISH WEIGHTS AND MEASURES.

In the foregoing pages, quantities of SO_2 have been expressed in centigrammes per litre, this being the most concise and convenient way. In order to permit rapid conversion to English standards, the following table has been compiled.

It may first be explained that centigrammes per litre are identical with parts per 100,000. They are likewise identical with grammes per hectolitre.

Centigrammes per litre = parts per 100,000.	Grains per gallon.	Ounces (avoirdupois) per 100 gallons.
1	·7	·16
2	1·4	·32
3	2·1	·48
4	2·8	·64
5	3.5	·8
6	4·2	·96
7	4·9	1·12
8	5·6	1·28
9	6·3	1·44
10	7·0	1·6

It should be remembered that fresh bisulphite of potash contains practically half its weight of SO_2. It follows that 5 centigrammes per litre of SO_2 are equivalent to .8 oz. of SO_2 per 100 gallons, or to 1.6 oz. of bisulphite of potash per 100 gallons.

Bisulphite soon loses SO_2 on keeping—after some months' storage the loss may be considerable, especially if it be not kept in air-tight tins or bottles.

(To be concluded.)

TWO NEW VARIETIES OF BLIGHT-PROOF APPLE.

By C. F. Cole, Orchard Supervisor.

A long-standing menace to the apple-grower, and one that has greatly increased the cost of production is the too well-known and widely distributed disease "Woolly Aphis" (*Eriosema lanigera*). Therefore, the raising of a variety of good flavour, form and colour, and keeping qualities, and one which in addition will remain immune from the disease must be of interest to all fruit-growers. This claim can be made for two varieties raised in recent times which have been named "Cole" and "Boswell."

The original seedling trees, although growing under similar climatic conditions, and alongside trees very prone to attacks from "Woolly Aphis," remained free from this pest. To test their immunity, scions were grafted upon stubs badly attacked by this disease, and the growths from the scions were tied to adjoining lateral growths from the stubs covered by "Woolly Aphis." Twelve months later the result was negative. During a later test a graft of the "Cole" variety became slightly attacked, but eventually cast off the disease.

In view of these severe tests, and the fact that the original seedlings remained immune, there is no doubt that these two varieties may be classed as "blight-proof." Another important factor found in connexion with both varieties is that if the flesh of the fruit is bruised, the injured portion becomes dry and corky, soft rot not developing. Apples so treated were tested under the cool and ordinary storage conditions.

During storage tests neither variety showed signs of "Bitter Pit" or superficial pitting, and so far both have proved good and long storers. The "Cole" variety has kept under ordinary storage conditions with safety until September. Though both these varieties originated in districts where ideal conditions exist for the development of the "Black Spot" (*Venturia inequalis*), they have proved so far to be unsusceptible to severe attacks and the "Cole" variety has shown a certain immunity against this fungus pest.

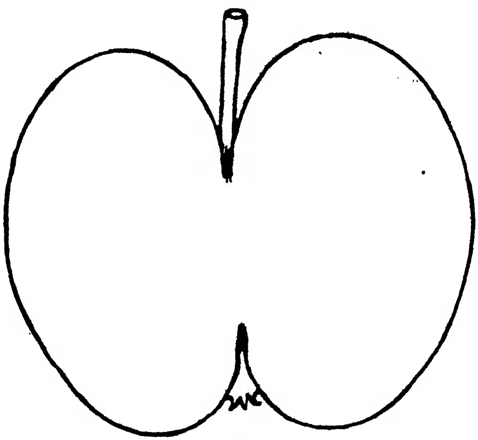
Boswell.

This was a chance seedling, which grew from a pip in the orchard of Mr. H. Boswell, at Stanley, Victoria. It is supposed to be a cross between the Winter Majetin and the Jonathan. The fruit gathered from the original seedling tree was submitted to the Committee of the Australian Pomological Society. The members reported that it was a beautiful apple. I first suggested the name "Boswell's Pride"; later owing to likely confusion the word "Pride" was dropped from the name, and it is now known as Boswell.

There is no doubt that when this apple becomes more widely known it will, owing to its great resemblance and freedom from "Woolly Aphis," be largely planted, and become a rival of Jonathan, and in many districts take the place of this highly commercial variety.

The tree is more productive, stronger, and more upright grower than the Jonathan; the wood is reddish in colour, and lightly speckled with greyish dots; the buds are full and prominent; the foliage in similar in shape, but slightly larger. The tree is an early bearer, producing its fruit upon spurs and lateral growths. The flowers are bold, the petals being full like the winter Majetin variety; the period of blossoming, partial and complete, is 15th to 23rd October.

The fruit is a handsome desert type of medium size; the shape may be roughly described as roundish conical, or tapering to the eye; the skin is smooth and thin, ground pale yellow, lightly splashed with lively red narrow broken stripes. The whole of the exposed surface is covered with lively red, deepening into a brilliant or dark red where exposed to the sun, faintly speckled with small light yellowish dots. The stalk, averaging three-quarters of an inch in length, is rather slender and inserted in a deep regular cavity. The flesh is white, sweet, tender,



Boswell.

juicy; the core is compact, the calyx is small, closed, the segments pointed, re-curved and set in a fairly broad deepish corrugated basin. Its season may be set down as from early March to June. If highly coloured it may be gathered early for export, and in cool storage it will remain in good condition until the end of November.

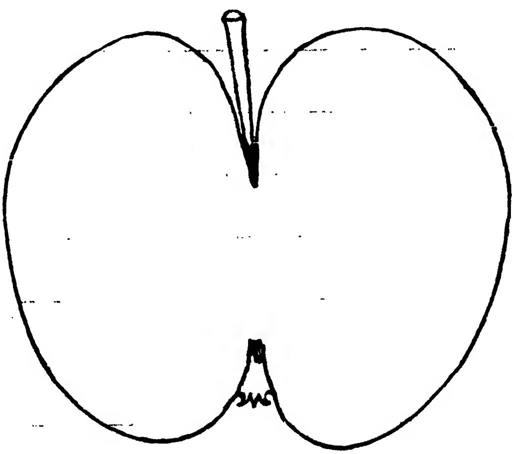
Cole.

This was another chance seedling; it is supposed to be a cross between "Jonathan" and "Dutch Mignone" varieties. The original seedling is still standing upon the property of Mr. R. G. Cole, orchardist, Lang Lang, Victoria, where the pip germinated. The producer first exhibited this apple at the fruit carnival held in the Exhibition buildings, Melbourne, in 1912, and won the silver medal for a Victorian-raised seedling. The seedling was registered with the Royal Horticultural Society of Victoria under the name of "R. G.

Cole's Champion." The writer submitted it under the name of "Cole's Champion" to the committee of the Australian Pomological Society, but owing to likely confusion the word "Champion" has been dropped, and "Cole" accepted as the future name of this apple.

The tree is very productive, and a strong upright grower. The wood is dark, becoming reddish in colour with age and lightly speckled with grey dots; the buds are moderately prominent; the foliage is medium in size, and dark green in colour. During the 1920 fruit season, 22 cases of saleable fruit were gathered from the original seedling tree. The flowers are not bold, and are medium in size. The blossoming period is from the 12th to 20th October.

The apple, which has been tested under cool store conditions, is also a handsome desert type of medium size, roundish conical, or tapering to the eye; the skin is thin and smooth; the ground clear pale yellow, splashed with lively red narrow broken stripes. The whole of the



Cole.

exposed surface is a light red, becoming deeper in colour where reached by the sun. The flesh is firm, white, crisp, juicy, sweet, with a slightly perfumed aromatic flavour; the core is compact, the stalk thin and averaging three-quarters of an inch in length, inserted in a deep, fairly regular cavity. The calyx is small and closed; the segments pointed, slightly re-curved, and set in a deep, rather narrow and corrugated basin. Its season is from April to September. It has been proved to be a very long cool storer, and while stored it emits a strong aroma. It could be gathered in some districts about the middle of March. This variety is being largely planted, and it promises to become one of the best late apples introduced.

Most of the cool store tests with both varieties were carried out at Mr. J. M. Rutland's Private Cool Stores, "Santa Rosa" Orchard, Kiewa, Victoria.

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652).

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Ammonia.	As Blood, Bone, and Flesh.	As Bone and Flesh.	As unspecified.	Total.	Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	As Muriate or Sulphate.		
		%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Nitrogen—Readily Soluble.													
Sulphate of Ammonia	A P P L and Sulphate of Ammonia in diamond	20·59	..	..	..	20·59	..	..	..	..	..	18 0 0	The Ammonia Products Pty. Ltd., Lyons-street, Footscray
Containing Phosphoric Acid—Readily Soluble.													
Superphosphate	Cresco, 18 Super.	..	..	..	..	..	17·00	0·50	1·00	18·50	..	5 10 0	Cresco Fertilizers Ltd., 111 North-terrace, Adelaide, South Australia
" "	Cresco, 22 Super.	..	..	..	..	..	21·00	0·50	1·00	22·50	..	6 12 6	" " "
" "	Cresco, 25 Phosphate	..	..	..	..	..	10·00	1·50	13·50	25·00	..	5 10 0	" " "
Containing Nitrogen and Phosphoric Acid—Moderately Soluble.													
Bone Manure ..	Cockbill's Bone Manure	..	5·50	..	..	5·50	..	4·00	10·00	14·00	..	12 0 0	W. and J. Cockbill, 407 Post Office-place, Melbourne
Animal Fertilizer	Valley	..	6·74	..	..	6·74	..	4·19	5·25	9·44	..	12 0 0	The Goulburn Valley Industries Co. Ltd., Shepparton
Bone and Blood Fertilizer	T.B. & S. in diamond	..	5·27	..	..	5·27	..	3·93	9·64	13·57	..	13 0 0	Thos. Borthwick and Sons (Australasia) Ltd., 84 William-street, Melbourne
Bone Fertilizer ..	Echuca ..	..	..	4·25	..	4·25	..	8·25	8·50	16·75	..	9 0 0	William George Boyle, Goulburn-road, Echuca
" "	Lloyd's ..	..	..	3·83	..	3·83	..	4·01	7·50	11·51	..	11 0 0	Edward Lloyd, Whitehorse-road, Box Hill
" "	Eagle Point .. E. T. Hoskins	..	..	2·90	..	2·90	..	4·50	13·50	18·00	..	7 15 0	Edward Thomas Hoskins, Eagle Point, Bairnsdale
" "	BF in circle Castle	..	..	2·00	..	2·00	..	1·50	14·50	16·00	..	10 10 0	H. C. Pannifex, 26A Market-street, Melbourne
Bone and Humus Fertilizer	Excello ..	..	..	3·80	0·20	4·00	..	2·00	8·00	10·00	..	12 0 0	" " "

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.					Phosphoric Acid.				Potash.	Price asked per ton.	Where Obtainable.
		As Ammonia.	As Blood, Bone, and Flesh.	As Bone and Flesh.	As unspecified.	Total.	Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.	As Muriate or Sulphate.		
		%	%	%	%	%	%	%	%	%	%	£ s. d.	
Containing Nitrogen, Phosphoric Acid, and Potash. Mixed Manure ..	Cresco ..	1·50	..	..	..	1·50	9·20	1·50	8·50	19·20	*2·50	8 5 0	Cresco Fertilizers Ltd., 111 North-terrace, Adelaide, South Australia
Containing Phosphoric Acid and Potash. Mixed Manure ..	Mixed Victoria Phosphate and Potash Sulphate	..	..	..	..	..	..	4·00	9·50	13·50	†5·00	8 6 0	The Phosphate Co-operative Coy. of Aust. Ltd., 440 Little Collins-street, Melbourne
Containing Potash. Sulphate of Potash	Hasell's ..	..	..	..	..	..	..	..	..	..	48·65	30 0 0	Arthur Harry Hasell, 17 Queen-street, Melbourne

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust	Bone B Dust ..	2·50	17·00	49·00	51·0	8 0 0	George Benson, Woodford
,, ...	Nova	3·00	18·00	30·00	70·0	11 0 0	H. C. Pannifex, 26A Market-street, Melbourne

* Potash as muriate.
† Potash as sulphate.

P. RANKIN SCOTT,
Chemist for Agriculture.

18th May, 1922.

A VALUABLE LEGUME.

Bokhara or Sweet Clover (*Melilotus Alba*, Desr.).

By J. W. Audas, F.L.S., F.R.M.S., National Herbarium, Melbourne.

Biennial Sweet Clover, or Bokhara Clover, belongs to the Melilotus family, and may be considered the best of its kind, being only slightly rivalled by its fellow species, yellow Sweet Clover (*Melilotus officinalis*) also a biennial plant, and Indian Sweet Clover or King Island Melilot (*Melilotus parviflora*), an annual species. Its origin is so remote as to have become lost in the dimness of obscurity. In common with lucerne, it is said to have originated in Bokhara (Central Asia), and it was certainly known at a very early period in all the countries abutting on the Mediterranean Sea. Having flourished in Europe for so many centuries uncultivated, it has come to be regarded as a weed; but an analysis of its food value revokes this stigma and proves it to be a fodder of highest value. It was not until cultivated in Europe, and then introduced into America, that the various species were segregated. These show up some very marked differences, but all maintain the distinguishing characteristic of the Melilotus family—a strong, sweet, and uncommon flower perfume—more particularly noticeable when drying—due to the evaporation of an ethereal oil which it possesses known as cumarin. So agreeable is this fragrance, that it was grown among hay in England and Scotland for its sweetness long before the fodder value was known or appreciated; but while this attractive sweetness may have popularized the plant, it is really the source of some disfavour, as the cumarin gives a bitter taste to hay which causes cattle to reject it. This bitterness, however, is said to disappear when the clover dries, because then the ethereal oils evaporate, while some of the fragrance remains. Stock will not usually eat Sweet Clover in the green state, but when dry, they will always eat it with avidity.

Yellow Sweet Clover (*Melilotus officinalis*) makes the best hay, as its stems are longer and finer than those of Sweet Clover, and it bears a bigger proportion of leaves and flowers. It is of erect growth, and reaches about 2½ or 3 feet in height the first year, and 4 or 5 feet during the second year. It blooms and matures quite three weeks sooner than Sweet Clover. Yellow Clover is said to be the secret of the rich flavour of the famous Gruyere cheese of Switzerland.

Indian Sweet Clover or King Island Melilot (*Melilotus parviflora*), though only an annual, is a really wonderful plant, giving splendid returns on soil of poorest quality. In fact, there is no need to plant it where better crops would thrive. It contains more cumarin than other species, and should not be fed to milking cows, as it is liable to taint the milk and butter. A striking example of what this plant will do can be seen at King Island, which in a few years has been transformed by it from a stretch of almost useless sand-hills into one of the finest grazing districts in the Commonwealth. It has improved the value of the land 100 per cent. by enriching the soil, so that crops of a more exacting nature may now be grown there.

Sweet clover may be grown for pasture, hay or ensilage, as a honey-producing plant, for improving soil, and for turning under as a green manure, and the method of culture does not vary for the different species, nor does the manner of handling differ much from that required by other clovers. It is very adaptable in climatic requirements, its hardiness permitting it to thrive in sub-tropical heat, and its frost-resisting qualities allow of its being cultivated as far south as cultivation

Melilotus Alba. Dosr.
(*a*) Portion of plant in flower and fruit. (*b*) Flower (enlarged). (*c*) Fruit (legume). (*d*) Seed (magnified). (*e*) Seed (natural size).

can be carried on. It is, therefore, suitable for growing over practically the whole of Australasia, from the far north of Queensland to the extremities of Tasmania. This statement does not imply that it will grow on every acre of our great continent, for Sweet Clover, like all its family, requires a certain humidity of soil which would not be

present in some parts of Central Australia; but given the necessary moisture, there is scarcely a soil so poor on which it will not flourish.

It must not be assumed, however, that Sweet Clover, on account of its hardiness, can be grown with less care than other legumes, and neglect of attention to details in preparation of soil has often led to much disappointment. The two main conditions which may be relied upon, however, to give maximum results are perfect drainage and abundance of lime. Its fondness for lime is the reason why it may be often seen in prolific growth on abandoned patches of gravelly limestone in mining districts. The bare spots sometimes seen on hilly pastures may be profitably sown with Sweet Clover, which, besides providing excellent forage, will fertilize these poor patches, so that later grasses will grow more abundantly on them. Sweet Clover will thrive on land too alkaline for grain or other clovers. Its long roots penetrate the subsoil, causing better drainage, and absorb the salts which are readily soluble in water.

Two outstanding virtues of this plant are its drought-resisting and frost-surviving qualities. While it will often withstand defective irrigation, and is capable of absorbing exceptionally heavy rainfall, it is still able to resist severe drought, as has been proved in the Mallee and Goulburn Valley of Victoria.

It may be sown either in spring or autumn, and cultivated in the same way as Red Clover. In rabbit-infested areas it is more advisable to sow in spring than autumn, as rabbits are very fond of the tender young plants in winter, but do not seem to trouble them so much in summer when other herbage is available.

Sweet Clover is a most valuable honey plant, and the honey produced from it is clear, with a slightly greenish tint, and of a strong vanilla-like flavour. As a green manure for ploughing under it would be hard to find a more suitable plant; it is particularly valuable for improving the soil for root crops such as mangels, beets, carrots, and parsnips. As ensilage, either grown alone or with other crops, it gives most satisfactory results, as it does not become slimy, as frequently happens with red clover or lucerne, and the food contains more protein than maize or other crops.

BRINE FOR CORNING BEEF.

A good pickle is made by mixing fifty lbs. of salt and five lbs. of finely-ground saltpetre, and dissolving same in twenty gallons of water. A test of whether there is enough salt in the brine is to place an egg in it; if the egg will not float, add sufficient salt to enable it to do so. Boil the brine and remove all scum as it rises to the surface. Five lbs. of sugar may be added, if desired, but it is not necessary except when pickling or curing bacon.

Spices are used only when it is desired to give the meat a definite spiced flavour.

The brine may be used over and over again, but it should be boiled occasionally in order to clarify it.

THE LARGE WHITE PIG.

By Sanders Spencer, in the Journal of the Ministry of Agriculture, England.

Although some writers have essayed to describe the origin of the Large White breed of pigs, and one or two have even mentioned the names of two or three men who were interested in pig breeding some three score or more years ago as the founders of the Large White breed, it must be admitted that complete success does not appear to have attended their labours. Indeed, if a claim had been made some fifty years ago that there existed a distinct type of Large White pig, it would have been most difficult to sustain it, for the simple reason that the white pigs found in Yorkshire and the adjoining counties had been so intermixed by the artisans and mill hands, who were the most persistent and successful exhibitors at the many district shows, that it had become impossible to foretell with any degree of certainty the size and character of a resultant litter of pigs from the mating of white boars and sows.

In the sixties and early seventies the favorite system of mating was to select a thick fleshed boar of small size and with a short head, and to mate it with a sow of the largest size, possessing quality of bone, flesh, and hair, a short face, and heavy jowls. As a rule there would not be the variation in size of the young pigs that might be anticipated, although later in life there might be a great difference in their development. The main reasons for this mode of procedure, which might not commend itself to pig breeders of the present day, were, that the fashionable pig of the period was one with a short head; that the wording of the prize schedules was usually, "For the best white pig not exceeding certain fixed ages"; that the most popular pig classes were those for pigs not exceeding six or nine months old; that prize winning pigs in the classes for young pigs were always in great demand at good prices from agents and exhibitors at the Royal and other large shows; that those pigs not required for breeding could be readily made fit for slaughter either as fresh pork or as baconers as soon as the weather became cold enough; that as a rule the young pigs, the result of mating a small and compact boar with a large sow, possessed the outward appearance and character of the sire and also acquired the quick growth of the dam, and thus had a great advantage when shown in the classes for small white pigs, which then were probably the most fashionable type of pig and most readily sold at the highest prices.

It may appear strange to pig breeders of the present day that exhibitors of pigs should purchase at high prices pigs of such uncertain breeding which were almost sure to develop unevenly; but the conditions were quite different half a century ago from those existing to-day. In the first place there was no fixed type or qualification for Small, Middle or Large Yorkshires, as they were then termed. The pigs of all three breeds were supposed to have short heads; this was imperative with Smalls and Middles and almost universal amongst Large Yorkshires.

Mere size at the time of exhibition was the determining factor as to classification, so that it was possible for a white pig to pass and win as a Small Yorkshire when young, and to develop so as to qualify subsequently for exhibition as a Middle White (or, as they were classified at the Royal Agricultural Society's show, as "a pig of any breed other than Berkshire, Small Black, Small Yorkshire, or Large Yorkshire"). Indeed, it was declared that one pig was actually exhibited in all the three classes for White Yorkshires at different shows. It is within the knowledge of the writer that the same pig has won at the Royal as a Small Yorkshire and in the nondescript class, and that a pig has won in the latter class and then in later years has won as a Large Yorkshire. Any difficulty which might have arisen was easily overcome by entering a pig as "age and breeder unknown." This last practice had become so common, seven prizes for pigs so described having been won at one Royal show, that the buyers from the United States discussed the question in the American live stock papers and asked how any pigs of unknown descent could qualify in the classes for pigs of a defined breed and possessing a pedigree? This, and the difficulty, if not impossibility, of identifying white pigs and their breeders, were two of the chief causes of the establishment of the National Pig Breeders' Association some forty or more years ago. Some few years before the classification of Yorkshire pigs had been altered at the Royal Agricultural Society's shows, where prizes were offered for Small White pigs, Large White pigs, and Middle White pigs, and as scales of points had been drawn up, these with the registered pedigrees of the pigs entered, insured to a considerable extent that the exhibits were accurately described and shown in the various classes. The comparatively short recorded pedigrees possessed by the pigs entered in the first few volumes afforded proof that the three varieties of Yorkshire pigs had not been bred on defined lines for any great length of time prior to the foundation of the herd book. Indeed it would be most difficult, if not impossible, to furnish proof that the Large White pig existed as a distinct and separate type before the seventies of last century.

About that period there was also a great change in the type of pig demanded by the purveyors of pork and especially by the bacon curers. Pigs furnishing a much smaller proportion of fat to lean meat were in more general demand. The introduction of the cold air system had enabled bacon curers to carry on operations with as great ease during the summer months as during winter, so the necessity ceased for salting heavily the bacon intended for consumption during the summer. The necessity for bacon pigs carrying a large proportion of fat to lean also ceased when the mild-curing system became possible with the aid of the cold air chambers. With the passing of the heavily salted lean portion of the bacon there sprung up an enormously increased demand for what has been termed "breakfast bacon," *i.e.*, lightly cured bacon carrying comparatively little fat and manufactured from pigs long in the carcass and thus affording the largest possible proportion of the middle portion of the side of bacon.

The bacon curers in these islands gave free expression in the public press to their requirements as to the form and degree of fatness of the

pigs for which they were enabled to pay the highest price, so that the breeders of the various kinds of pigs had placed before them a model to which they might work up. The general body of pig breeders did not seem inclined to make any great alteration from the type of pig which they had been breeding, but one or two breeders of Large White pigs were apparently impressed with the fact that with some modification their favourite breed of pig could be made so that it would qualify as a bacon curer's pig. The jowl was lightened, the shoulders were made much lighter, the lean meat increased, the bone was made of finer quality, the form of the ham was improved and the quantity of fine hair increased. In the seventies of last century the Large White was a large pork pig, in the eighties and nineties it was a bacon pig. The so-called improved Large White and its crosses were tried by the home curers with satisfactory results; the bacon placed on the London and Manchester markets complied so much more nearly with the requirements and fancies of the consumer than did the imported bacon, that the manufacturers of bacon in Denmark purchased a considerable number of large white boars from a large herd in the Midland Counties. The results were so satisfactory that the Canadian curers sent orders for breeding pigs of the Large White breed to the same breeder. Eventually exports of Large White pigs of this distinct type were made to all those foreign countries where bacon curing is carried on to any extent.

The Large White pig had become so popular that foreigners whose native pigs were far too small and short, purchased at prices which were at the time considered to be exceedingly high, the largest pigs of the breed, those which were long in the face and high on leg. Unfortunately, owing to this, a large proportion of the breeders of Large Whites followed the example of the Berkshire breeders by studying the requirements of this limited portion of the buyers of pure-bred pigs whose wants were of a special character, and by so doing rendered their pigs of considerably less value to the greater portion of their customers whose demands were for smaller fine joints from pigs which developed early. The breeders of the Berkshires have restored their pigs to public favour and usefulness and there are clear signs of an awakening of the breeders of Large Whites to the fact that although fancy points help to sell a few pigs at high prices for a short period, the commercial market is of greater importance and is more continuous. The number of breeders of Large Whites does not appear to have increased in recent years.

Although the sows of the Large White breed are at the least the equals of sows of any other breed or cross in prolificacy, in milking, and in the general duties of motherhood, the strongest claim for popularity of the Large White pig probably rests on its wonderful capacity for crossing on pigs of almost any breed and rendering the joint produce suitable for the wants of the bacon curer. At the present time it is declared that no breed or cross of pigs so nearly supplies the wants of the manufacturer of the bacon which realizes the highest price on our best markets and which is in the greatest demand than does the cross-bred pig produced by a Large White boar and a Large Black sow.

The National Pig Breeders' Association has published what is termed a standard of excellence which may be of some value but which might perhaps be of still greater assistance if the market and the breeding value of each point had been stated. It is as follows:—

Colour.—White, free from black hairs and as free as possible from blue spots on the skin.

Head.—Moderately long, face slightly dished, snout broad, not too much turned up, jowl not too heavy, wide between the ears.

Ears.—Long, thin, slightly inclined forward and fringed with fine hair.

Neck.—Long and proportionately full to shoulders.

Chest.—Wide and deep.

Shoulders.—Level across the top, not too wide, free from coarseness.

Legs.—Straight and well set, level with the outside of the body, with flat bone.

Pasterns.—Short and springy.

Feet.—Strong, even and wide.

Back.—Long, level and wide from neck to rump.

Loin.—Broad.

Tail.—Set high, stout and long, but not coarse, with tassel of fine hair.

Sides.—Deep.

Ribs.—Well sprung.

Belly.—Full but not flabby, with straight underlines.

Flank.—Thick and well let down.

Quarters.—Long and wide.

Hams.—Broad, full, and deep to hocks.

Coat.—Long and moderately fine.

Action.—Firm and free.

Skin.—Not too thick, quite free from wrinkles.

Objections.—Black hairs, black spots, a curly coat, a coarse mane, short snout, inbent knees, hollowness at back of shoulders.

Large bred pigs do not fully develop their points until some months old, the pig often proving at a year or fifteen months a much better animal than could be anticipated at five months and *vice versâ*, but size and quality are most important.

ARSENICAL POISONING.

The medicinal treatment for arsenical poisoning should be prompt and thorough. In small animals, such as dogs and cats, an emetic is advisable, such as salt and mustard in about 3 oz. of warm water. With horses and cattle, medicine must be given, which forms an insoluble compound with the arsenic.

The following treatment is recommended:—Take about 2 oz. of ordinary washing soda, and dissolve it in about half-a-pint of water, then add 2 oz. liquor ferri perchlor; a sediment forms, and it is then strained through a piece of fine linen and the sediment collected and mixed in 1 pint of cold water and given as a drench, being repeated every half-hour for at least five or six doses.—*Queensland Agricultural Journal.*

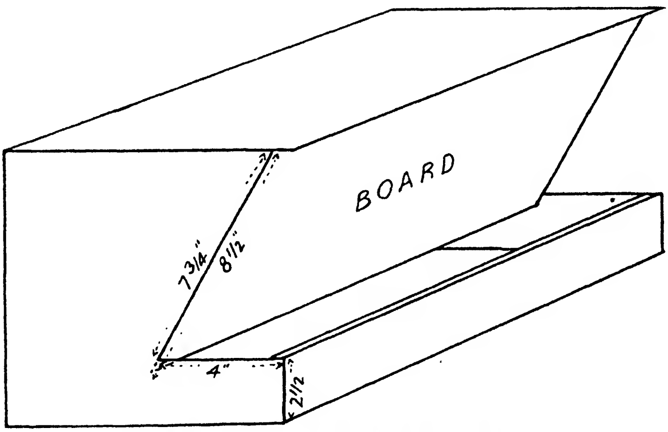
HOPPERS FOR FEEDING DRY MASH TO POULTRY.

SIMPLE METHODS OF MAKING.

W. C. Rugg, Poultry Foreman, Werribee State Farm.

1. From Kerosene Tins.

Cut tin along part indicated by dotted lines on diagram. Turn edges and hammer smooth and turn half-an-inch of front inwards to form a lip to prevent birds pecking the food over the front and wasting it. Cut a piece of thin board (portion of a kerosene case will do) to fit neatly where marked; the bottom edge of this board should be half-an-inch lower than the front of trough, and it can be held in position by a few nails driven through the tin round the edge of the board.



Dry Mash Hopper made from Kerosene Tin.

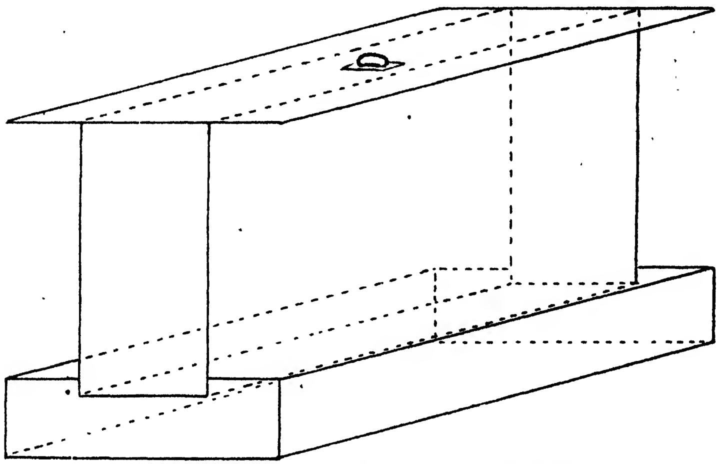
To fill the hopper place it on its back and place some dry mash in it, and shake mash to the top and repeat till full.

When using a hopper of this kind for small chickens, fix a piece of wire netting of an inch and a half mesh across the trough. The chicks will feed through the netting, and will be prevented from getting into the food and scratching it out.

2. From Kerosene Cases.

Two hoppers can be made from three cases. Cut one the full length on the flat to make a tray 4 inches deep, and remove a piece of 7 inches long x 1 inch deep from each end of this tray. Then make a box 14 inches deep without top or bottom; use a board 6 inches x 1 inch for the ends and pieces of kerosene cases for the sides. This will make a

magazine to hold the food. It should fit nearly into the spaces 7 x 1 inch cut out of each end of the tray. For the top take a piece of tin 18 inches wide and 21 inches long; nail a piece of 6-in. x 1-in. board along the centre of the tin; this board should fit inside the top of the magazine. The tin will project over the tray, and prevent the birds' droppings falling into the food should they perch on top of the hopper. Tack a lath an inch in width to the sides of the tray all round to form a lip so that the birds may not pick the food over the front, and so wasting it.



Dry Mash Hopper Made from Kerosene Cases.

Modern Farm Practice.

What has the farmer learned in these fifty years . . . ? He has learned that the soil is not a sullen, lifeless thing, only useful as a standing place for his crops, but that it is rather to be likened to a farm animal and valued accordingly. . . . Practically all that we know regarding the bacterial life of the soil is a harvest of the last fifty years. The formation of humus in the soil, the solution of plant food from the soil minerals, the conversion of nitrogenous materials into forms which the crop can utilize, and the gathering of free nitrogen from the air—these are the great functions of the soil bacteria. Much remains to be learned of their nature and their needs . . . but what we know already is coming into common farm knowledge and having its effect on farm practice.—Dr. E. H. Jenkins, Connecticut, U.S.A.

CLEANLINESS IN DAIRY AND FACTORY.

By G. C. Sawers, Cheese Expert.

A dairy or butter factory does not consist of a room and nothing more, and such a place should not be spoken of as clean unless everything down to the smallest utensil is quite free from all dirt, and, further, that all employed there are clean, and that the surroundings of the building are kept free of all boxes, barrels, &c., and that the wood pile is neatly stacked and the chips raked into a tidy heap.

The boiler and engine room should be kept as neat and clean as any other room. The walls and ceiling should be whitewashed or painted, and a shelf or two placed on the wall to hold tools, &c., when not in use. The boiler and engine should be painted. It should be wiped over daily, first, with an oily cloth, and then polished with a dry one. All brass mountings must be kept bright and the valves and unions well packed so as to prevent waste of fuel and any escape of steam. The floor should be swept or scrubbed every day, and the firewood must be neatly stacked.

The making and curing room walls and ceilings also should be given a fresh coat of whitewash once a year. If whitewash be chosen, no skim-milk or casein preparations should be used, otherwise moulds will develop. All vats, cheese presses, and troughs must be painted or varnished. The piping should be given a coat of aluminium paint; this will tend to brighten the room. The windows ought to be regularly and thoroughly cleaned.

It is essential that milk chutes, scales, vats, &c., &c., be cleansed as soon as practicable after use. They should first be washed in cold water, then with hot water, to which a little soda has been added, and then scalded.

Nowhere does the old rule of a place for everything and everything in its place apply with greater force than in a cheese factory.

When the whey is being drawn from the vats care must be taken to prevent any running on the floor, as the acid of the whey will eat into the cement. By using a tin or galvanized chute with head attached. the escape of whey may be stopped.

The curd racks should be well scrubbed and washed every day and placed in the open air for some time. At least once a month they ought to be placed in a solution of lime water.

The draining cloths should be first rinsed in tepid water and then in hot water to which soda has been added, and afterwards dried in the open air. If not thoroughly washed they may develop a heavy whey smell, which may sometimes even be tasted in the cheese.

The cheese presses and hoops should be washed and scalded once a week. This is particularly necessary in the case of the hoops, as unless they are perfectly clean whey may adhere on the inside; this

will cause the rind on the cheese to become rough and loosen the binding, and thus possibly allow the cheese to crack.

The scrubbing of the floor of the making room, gutters, &c., should be a daily duty.

The curing room must be kept well aired, and the floor and shelves clean, otherwise mites may breed there and cause trouble and loss. It is best to keep nothing in this room but cheese, which should be stacked evenly on the shelves. If cloth and binding be stored there, they must be stacked in a neat way. On no account should any timber or boxes be left there. After every consignment of cheese has been sent away the shelves should be at least wiped down with a damp cloth; or if the cheese has lain upon them for any length of time they should be scrubbed. The floor of the curing room, like that of the other rooms, should be kept clean and be frequently scrubbed.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

If the winter spraying has been delayed, it should be completed as quickly as possible, and before the buds begin to swell and burst.

It is not advisable to spray the stone fruits with the red oil emulsion at this time, as there is danger of burning and destroying the early buds that may be swelling, and consequently loosen their outside scales. It will be safe, if the work be done at once, to spray apple, pear and quince trees with this spray, especially where the Byrobia Mite, scale insects, or woolly aphis are prevalent.

If it is intended that the lime-sulphur wash be the specific for these and other pests, it may be used with safety, although the spraying should be completed as early as possible.

That the lime sulphur is valuable as a specific against "Black Spot" of the apple was shown in the report of the experiments in the *Journal of Agriculture* for August, 1918. The first spray should be given when the flower buds are more green than pink; and the second spray, when the centre flowers of the blossom cluster are pretty open.

The same report showed that a spray of 6.8.40 of copper-soda, sprayed when the earliest buds were showing pink, was a complete success against the "leaf curl" of the peach.

Where peach aphis has appeared, it will be advisable to spray at once with a strong nicotine solution. Tobacco stems should be soaked in cold water for some days, and a teaspoonful of caustic soda added to a cask of steeping stems. The liquid should be made strong, and every endeavour made to kill out the first insects that appear. The preparations known as Black Leaf 40 and Nicotox are useful for this work.

The pruning of deciduous trees should be at an end this month The pruning of evergreens such as oranges, lemons, and guavas, may be left until later.

Young deciduous trees must be planted not later than this month. The soil should be trodden firm round the roots, and, when planting has been completed, the tree ought to be headed back to three or four buds on each arm.

Preparation may be made for planting citrus and other evergreen trees. It is necessary that the soil be well ploughed and sweetened in anticipation of planting in September and October.

In root-borer affected districts, the beetles will begin to appear during the latter part of the month. A close observance should be kept on them and the insects regularly collected and destroyed.

The Flower Garden.

All winter-flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and hand picking. The seedlings growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as delphiniums, cannas, shasta daisy, herbaceous chrysanthemums, rudbeckias, salvias, and phlox, may still be planted out. If it is intended to leave the plants in the places they occupied last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By this means the plants retain their vigour, and are able to produce good flowers each season.

Evergeen shrubs may now be planted out, if the spots chosen for them have been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants, including Gladioli, may now be planted. Gladioli so planted will bloom in December.

The Vegetable Garden.

The plots should be well dug over at this time, adding gypsum or lime where any pests have been prevalent. In other beds stable manure should be well worked into the soil.

The soil should be rich, well worked, and warm, so that a quick growth may result. Vegetables quickly raised are generally more tender than slowly grown ones; and frequent changes of crops in the plots will give better results. At this season, the weeds will require constant checking; frequent use of the hoe will, therefore, be necessary, and in the rows hand-weeding should be resorted to.

All seedlings should be planted out, especially seedlings of cabbage, cauliflower, lettuce, and onion. Seeds of peas, carrots, parsnips, radish, lettuce, tomato, and broad beans may be sown.

Where they can be sheltered and protected from frosts, young tomato plants may be planted out for early fruiting. One method of managing these early plants is to place the young plant a few inches below the surface, and then a box, 8 or 9 inches deep, with top and bottom removed, over the plant at ground level. This can then be covered loosely with a piece of glass whenever necessary.

Potatoes, artichokes, and asparagus crowns may be planted. Asparagus beds should be kept free from weeds; they should have a loose surface, and a light top dressing with old manure would be beneficial.

In the frames, cucumber, vegetable marrow, melon, pumpkin, water and rock melon seeds may be planted. These are best planted in pots placing three or four seeds in each pot; they then suffer no check when being transplanted into beds.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

HORSES.—Feed stabled horses well; give green stuff if available. Continue rugging to encourage the shedding of the coat; good grooming will also be beneficial. Give hay or straw to grass-fed working horses. Feed old and badly-conditioned horses liberally. In foal mares due to foal early, if worked, should be turned out to paddock. Stallions doing stud duty should be fed liberally. Equivalent amount of cracked Indian corn (maize) may with advantage be substituted for oats, if latter grain is scarce.

CATTLE.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture*, 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how

to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland :—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ½ lb. of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

PIGS.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

SHEEP.—Wherever early shearing is possible, and shelter available, all sheep to be disposed of can be fattened earlier, if shorn. Sheep, or lambs in the wool, when not good enough for freezing, also thrive better after being shorn. Where insufficient knowledge of grading cross-bred wool exists, draft the coarse sheep from the fine before coming into the shed, and shear and bale separately. Clean all daggy sheep before bringing them on to the shearing board. Avoid deep and careless skirting in small flocks. Only very seedy parts, and heavy fribs and stains should come off fleeces. Press in a box press, which forms square sides to bales, and avoid round bales, called "Sew Downs." Pack in all possible. Brand boldly and neatly on the long and narrow side. Clean carefully all straw, chaff, &c., from shearing place. Cut back all misshapen feet when noticed during shearing. Mark all ewes with misshapen udders, faulty mouths, yellow and common fleeces. Class all well-bred Merino-Longwool lambs before offering to exporters. Earmark, and keep best early-born lambs for future breeding and wool-growing. Well-bred, shafty, deep-stapled, fine to medium grade wools will be required for years. The world has an ample supply of short. and inferior wool.

POULTRY.—September is one of the best months for hatching for winter eggs Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses and Insectibane or Izal in nests—nothing stunts chickens quicker than vermin. The food for young chicks should be fine oatmeal, stale bread crumbs or biscuit meal, a little calcined bird's grit, a little chopped green stuff such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

FARM.—Plant early potatoes, and work up fallow for the main crop. Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with the fallowing in the Northern Districts. Prepare land for tobacco seed beds by burning rubbish on the site; afterwards work up to depth of three or four inches.

ORCHARD.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with copper soda as the blossom buds are opening, as a preventive of "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution

FLOWER GARDEN.—Cultivate and work up the surface to a fine tilth—clean out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

VINEYARD.

Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as tying down of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted), cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swab vines preventively with acid iron sulphate to protect them from Black spot, or Anthracnose. Should next spring be a wet one, disastrous outbreaks are probable in vineyards which have not received proper treatment. To avoid scalding, swabbing must be completed before the buds commence to swell. A bulletin (No. 42) dealing with this disease will be posted on application. Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar.—Conclude spring racking early in month, if not already done. Fill up, regularly, all unfortified wines.

BEE-KEEPING.

During the first or second week of September all hives should be examined to see that each colony has a laying queen and sufficient stores of honey to permit of normal development. Bees work with a reserve of stores at this time of year, and when their supplies are reduced to a certain minimum, brood rearing is restricted, may cease altogether for a time, and when, as a result of prolonged unfavourable weather, the reserve stores are used up, even sealed brood may be torn open and thrown out and the colonies practically ruined for the season.

Strong colonies should have 15 to 20 lbs. of honey ahead of daily requirement, medium and small colonies proportionately less. When during the examination of the hives less than this amount is found, the shortage should be made good by feeding, blood-warm, and inside the hive, a syrup made by dissolving 1½ or 2 parts of best white sugar in one part of boiling water. What is known as a frame feeder is the most suitable one for this purpose, or a simplicity feeder in a shallow super over the brood chamber may be used.

When no feeders are on hand, the syrup may be poured in a fine stream from the lip of a jug into an empty comb laid flat into a suitable dish. The jug should be held about 12 to 15 inches above the comb, otherwise the syrup will not enter the cells. After filling both sides, and keeping it in an upright position for a few minutes to drain off the surplus, the comb can be returned to the hive, repeating the operation on succeeding days till the needs of the colony are supplied. Honey of unknown origin should never be used for feeding on account of the risk of introducing disease.

Any colony found queenless, as indicated by the absence of brood or eggs, may be kept going till a queen can be raised or procured, by giving a comb of eggs or young brood from a strong colony once a week, provided there are sufficient bees left to make it worth while; if too small, unite with the nearest normal colony.

In early districts and where colonies went into Winter strong in bees, swarms may be expected from the middle of September onwards. Hives and frames for the number of first swarms expected should be on hand and ready for immediate use, so that none of the bees' labour may be wasted by allowing them to build comb in a temporary box. All frames should be wired so that newly-built comb may not break down in handling or during hot weather. Under normal conditions a swarm with a good fertile queen will build all worker comb during the first three weeks. It is the only time a full colony will not build drone comb from starters of foundation. While the queen deposits eggs into the worker cells as fast as they are constructed by the bees there will be no drone cells built. After three weeks the young bees from the first-laid eggs will hatch out, and the queen will return to that part of the comb to again deposit eggs into the vacated cells, and the newly-constructed cells on the edges of the comb being neglected by the queen, the remainder of the space in the frames will be filled with drone comb.

The aim of the bee-keeper, therefore, is to confine the building of comb from starters to the number of frames likely to be completed during the first three weeks after hiving the swarm, by removing two, three, or four frames in which no comb has been built four or five days after hiving. The follower or dummy board is pushed up against the remaining frames, and when these are completed frames with full sheets of foundation are added to make up the set.

Hives should always stand level, crossways to the frames; in the case of swarms hived on starters of foundation it is particularly important. Comb is always built truly perpendicular, and if the hive is not level to the frames the wires will be outside, instead of in the centre of the comb.

TO POPULARIZE HONEY.

Every effort should be made by all interested in the honey business to stimulate the sale of the commodity, for there are still fairly heavy stocks on hand, and although honey can be kept for long periods without fear of deterioration, it is to the advantage of all concerned—providing, of course, a reasonable price can be obtained for it—that a good deal of the surplus be disposed of before the new season's crop comes. Something has already been said in this journal with reference to improving the honey market by co-operation and the decentralization of supplies, and in the past few months there has been some improvement in the matters of distribution and sales. The appointment of three practical apiarists as an advisory board to look after the bee-keepers' interests in co-operative marketing was one step in the right direction, and the co-operative retail marketing movement in which the New South Wales Apiarists' Association is now interesting itself, is another. There is still a good deal to be done, however, before marketing conditions will be on anything like a satisfactory basis. The bee-farmer's interest in marketing should not cease when his individual

crop is disposed of. Every effort should be made to induce distributing agents and storekeepers who have honey for sale to have the commodity exhibited in a position in which it will come well under the notice of possible customers. It is quite a common practice for such agents and storekeepers to place honey on shelves set so low as to be practically out of sight, and to give it the poorest sort of window display. Where space is limited, some sort of attractive display notice should be supplied and the retailer encouraged to make use of it. Again, those interested in the industry should never neglect an opportunity of inducing friends and acquaintances generally to use honey in their homes, or of bringing to the notice of the boardinghouse-keepers, hotel proprietors, and persons interested in the conduct of large institutions the value of honey as a food. Honey is a good food and a cheap one, and it is very much to the bee-keepers' interest that it should find a place on the lowliest table.

With regard to honey prices, the fact that there are among the ranks of bee-keepers a good many amateurs and bee-keepers in a small way, is apt to constitute something of a menace. Some of these dispose of their crop at a ridiculously low price to the disadvantage of the commercial man who depends on his returns for a living, for naturally the people who purchase at the low price do not afterwards care to pay a high one to the commercial bee-farmer, even though it be a fair one. Both the bee-keeper making the low-priced sales and the industry at large would benefit greatly, if trouble were taken to discover the fair market value for the produce.

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THE STANDARD HERD TEST—SEASON 1921-22.

Conducted by the Department of Agriculture.

TENTH ANNUAL REPORT.

(*J. M. Kerr, Herd Registrar.*)

"Tested" not "Certificated."

Before entering upon any remarks in reference to this Herd Test, there is need to warn dairymen of the necessity of discriminating between a TESTED and a CERTIFICATED cow. The word "tested" is frequently abused by being applied to animals whose milk has been tested perhaps only once, or may be to one that has been tested and failed, and which may be the veriest duffer. If a seller of a cow claims that she is tested, let him point out her records in the annually published reports of the records. Dairymen need warning not to be misled by reference to a "tested" herd or a "tested" cow, in absence of the actual records over the whole nine months' lactation. Mere high test is not enough. The value of a test depends on the milk that goes with it. The only thing a cow can be judged on is the total butter-fat for the nine months, which is published in an annual official bulletin, and is available to any dairyman who may apply for a copy.

The Present Low Average Return.

As a rough estimate, the average annual butter-fat yield in Victoria is set down at about 160 lbs. per cow. On the face of it, this miserable figure, representing a gross money return, on a liberal basis, of say £200 per year from a number of twelve cows (a man's full ten hours' labour), which necessitate an original capital outlay of approximately £1,200, would appear to give a clue to the preference displayed by most younger men for city occupations. That part of the dairyman's

misfortune is, however, within his own power to remedy, as has been done in so many of the herds whose returns appear below.

A return like that mentioned is sufficient in itself to explain any dissatisfaction which might exist with regard to the dairy-farming life. Poor and all as it is, we cannot fairly go on all the time making accusations of incompetence from afar, and altogether ignore the peculiar difficulties against which the man on the land has to contend. If a dairy-farmer will not educate himself to his calling in these days, his piece-work occupation exacts the full penalty, and some of them are paying it. If the severity of the inevitable punishment will not stimulate a man to better things, then neither will recrimination do so. This is recognised, and whatever is said in this report is said in the interests of the industry as a whole, without any wish to speak harshly of any worthy individual, however low his income. When a man is honestly struggling against odds, want of appreciation helps in no wise, and appreciation cannot be withheld from men who, in spite of their most obvious ineptitude, not only perform the, comparatively, child's task of holding the home market with their product against all comers, but continue to carry on for the rest, on whatever might accrue to them from the competitive prices on the other side of the world. This is a great work in itself, and while one is more or less decrying the average farmer's managing capacity, as reflected in the low average returns, it is only fair to recognise the character which achieves this distinction, so praiseworthy in a local industry.

By what virtue does the dairy-farmer thus perform what so many refuse to attempt? One would like to attribute the achievement to especial efficiency entirely, but cannot honestly do so. We know positively that our dairy-farmers are accomplishing a great task, but one has only to be acquainted with the personal working of the farms throughout the State to know that there is no general evidence of such superior efficiency as would of itself explain the feat. Then, how is it done? Undoubtedly because in the great majority of cases farmers are satisfied with little, or, in other words, by an efficiency of endurance rather than of methods. This is decidedly unsatisfactory in an industry which can continue to exist only by progress. All the same, there is no other explanation, and there is plenty of evidence of it out on the farms; if there were not, the knowledge of the low butter-fat returns would confirm it.

The fact of the matter is, that any remotely situated industry, obliged to hold its own in an open market, cannot hope to maintain labour conditions any more decent than its competitors unless it can bring to the task a superior efficiency of method and plant. In proportion as this is lacking, sacrifice in the form of either longer hours of labour, or its equivalent—smaller remuneration—has to be accepted and endured. We may go on selling our butter in London for the same price as our competitors and imagine we are competing, but if it is done by undue sacrifice, as in the case of so many of our dairy-farmers, it is none the less failure.

Whether the hard-working farmer realizes it or not, the fact remains that butter-fat, which costs the selling price to produce, is severe coin with which to acquire a farm. And yet, how very numerous are

those who are struggling on to purchase their homes with just this sort of earnings. It may be their own fault, or it may not. Whether it is or not is, from a State point of view, beside the question. The important point is that they are failing, inasmuch as they are unprofitably employed in occupying a full year of time to produce half a year's fair income, and can provide no source of wealth from which to finance necessary national expenditure, without absolutely crippling themselves to a degree of hardship utterly unendurable. Their displacement would be no actual economic loss had the State a more competent class of man available and willing to step into the breach. But this more intelligent class is, alas! mostly elsewhere, and shows no disposition, under present conditions at all events, to display its mettle at dairy-farming. We must either educate the man we have, or make it worth while for better men.

The Winning Herd.

Owned by Mr. T. Mesley, "Warenda," Dalyston.

8 Mature Cows averaged 466·52 lbs. Butter Fat.
3 Second Calf Cows averaged 454·82 lbs. Butter Fat.
5 Heifers averaged 409·08 lbs. Butter Fat.

Increasing Rural Population of the State.

The problem of supplementing the State's rural population is a matter of popularizing country as compared with city conditions. With all due respect to those who advance the introduction of such things as telephones, high schools, motor roads, and organized amusements, &c., as sufficient to do this, all of these together would not likely prove so potent a charm for the purpose as the great outstanding need—higher relative remuneration. This can take no better form for needy people, than common cash, immediately negotiable.

The spur of necessity is behind us, and this has to be effected somehow, if the present-day tendency to abandon the country for the city is to be countered and the financial stability of the nation preserved. Whether the adjustment of the remuneration in the desired direction can be better brought about by deducting from the present standard of the city or by adding to that of the country is for the "powers that be" to determine. If the latter is to be the policy, no

more useful or opportune project was ever launched than the present scheme of testing for the utility pure-breds, which must be the nucleus of all our future dairy stock, if the satisfactory profits now worthily won by some are ever to become general, the only thing which will ever make dairying the asset we hope for—a popular, self-supporting industry.

The objective of the Government Herd Test is definite, and it is significant that its heartiest advocacy is coming from the most progressive men of the industry, who are best qualified to know. If it does not mean better profits for those dairy-farmers who avail themselves of its lessons, it means nothing. It is offered by the people's Government in appreciation and recognition of the important position

Reserve Annual Champion Cow.
Mr. G. A. Waite's "Dominion Segis Fobes."
(Born 21.9.16.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1921–22	18,895	3·26	615·81

the dairy-farmer occupies in the community. It was instituted not a day too soon. The fact can no longer be blinked that much of the unpopularity of the dairy-farming life is due to the difficulty so many experience in anywise comfortably making ends meet. Too often the farm can be held only by the occupiers denying themselves common comforts which have now become human rights, or else by throwing their families into the breach to stop the fatal financial drift, which otherwise must go on wherever any but high-class management prevails. Such living conditions can never be popular with the mass; and so it is that the willingness of people to stay on the land is wrapped up in that "blessed" word "remuneration," which, when used as a solution of the "drift to the city" problem, might well be honoured with a capital letter. It enters just as largely into the

present movement for increased immigration, seeing that the assisted new-comers are expected to prefer the landed occupations. In the end, it will be the relative remuneration which will determine their place of domicile as assuredly as it is now influencing the native-born. See how the acreage sown to a particular farm crop increases as soon as its price rises to a proportionately higher level. Likewise, just let the relative remuneration be increased where the people are needed, and the equilibrium of population will be restored in one act.

In the absence of anything occurring to reduce the present debit side of his account, any dairy-farmer is, and will remain, an industrial inferior who cannot bring his credit entries up to at least 250 lbs. of butter-fat per rationally-fed cow. The portentousness of this fact exists in the greatness of the present disparity. This reveals a serious position for a country of comparatively empty spaces which depend for their peopling on the popularity of the landed occupations. Mr. Clapp has admitted that one of the greatest difficulties with which the Railways Department is beset is the sparseness of the rural population. Anything which can be done fairly to increase the popularity of dairy-farming must eventually prove to be good policy, and it is eminently a function of the Agricultural Department of the State to concern itself, as it is now doing, with at least that unnecessary diminution of earnings which is inseparable from the miserably low gross butter-fat returns.

The Cause for the Present Low Average Yield.

No time need be lost in searching for the causes of the dairyman's poor showing in this direction; it is already well known. When a healthy dairy cow fails to yield at least 250 lbs. of fat per year, the cause need not be sought further than in her breeding, feeding, or handling. If one of these factors is defective, it is quite sufficient to nullify even perfection in the others, and there are few farms where there is not room for at least some improvement in respect of one or another of them, and likely enough all three.

The Object of the Herd Test.

Until the Government Herd Test was instituted ten years ago, the officers of this Department were not in a position to offer more than general advice as far as the quality of the animals was concerned, and, consequently, had to attack "the small yield problem," mainly as a matter of feeding. The feeding and general treatment of the cow are no less important than her breeding (in fact, all are interrelated); but there is no food, however good, which will turn to milk in a cow that is inherently incapable; consequently, better feeding can be recommended for good cows only, or at least cows that will correspondingly respond. These represent but a proportion of the total cows, and until dairymen place themselves in a position to know which from which, it is doubtful if advice to feed more liberally would ever give any real economic gain in the aggregate. In fact, unless the feeder knows the respective capacities of his animals, more generous feeding may easily result in lowered commercial return through sheer waste of good material.

Advice on feeding was thus ever stultified by farmers refusing to keep comparative milk records, and also because, in the absence of tested pure-breds, a herd-owner was necessarily at a loss to know where the recommended class of bull, likely to beget the responsive cow, could be obtained. The best bulls in those days were merely "pure-bred" as the herd-book rules interpret the term, but it has long been recognised that something more was wanted. Breed-purity, in itself, never was, never is, and never will be quite a sufficient indication of the merits of a dairy cow, so long as the breeder is so self-conceited as to imagine that his judgment is as good as the scales and tester. And so it was that in pre-Herd Test days, there was no means of knowing whether a pure-bred bull was pure in the essential principle of production—the only kind of purity likely to much improve the position of the general dairy-farmer.

This, then, was the position:—Granted the Victorian average butter-fat yield was discreditably and dangerously low; granted this was largely due to the inherently poor "dairy" quality of the animals; granted the inferiority was due to the haphazard mating of good, bad, and indifferent parents; what was the best thing for well-wishers of the industry to do? In the circumstances, the old and easy platitude, "breed better," was little better than mere mockery. "Breeding better," if it means anything, means breeding by selection, which, in the case of the general dairyman, means selecting the right bull. But what evidence worth while had any one of the producing principle in any bull he might purchase at that time? And what chance has the would-be improver, if this knowledge be lacking? Very little, indeed!

To be able to recognise, with any degree of certainty, the real dairy cow (when she exists), her own producing capacity, and that of all her surrounding genealogy must needs be known. Consequently, to make any considerable improvement over the whole State, reliable records of very many animals must be available; in fact, there can never be too many, nor can the information be made too wide-spread. There is need especially to identify every potentially good bull wherever he exists.

Can any one suggest how this valuable information can become public property except by a system of State herd-testing, and can any one propound a scheme which will answer the purpose more effectually than the Government Standard Herd Test? Even its most ardent critics baulk at doing this. The lowness of the State's average butter-fat return is evidence enough, in all conscience, that the industry needs an uplift, but this is far off unless we attain the better class of cow which this scheme of testing makes possible. Logically, all those farmers, at least, who obtain the sub-average returns should be mal-contents; if not with some one else, then with themselves. They have primitive tastes, indeed, if they are satisfied with the monetary return from such a yield, and one would expect that they would seize with avidity upon any proposition that would better them financially. Yet we see no whole-hearted support, either material or moral, coming from the general dairy-farming community for the present herd-testing scheme, designed, conducted, and almost wholly financed by the Government for their especial benefit. It only serves to show the preponderance in the industry of a type unable to recognise a business

bargain when they see it. This is really the chief lack of the industry. It needs, most of all, more men possessed of commercial instincts, and this is the class of man it would pay the State best to win back to the vocation. It wants more men who calculate in terms of £ s. d.; who appreciate that the pound-note that takes twelve hours of labour to earn is not as good value as the one that takes eight; who grasp the meaning of return from capital, as distinct from labour return; who know what overhead charges and turnover mean; who recognise the importance of efficiency in both working plant and management.

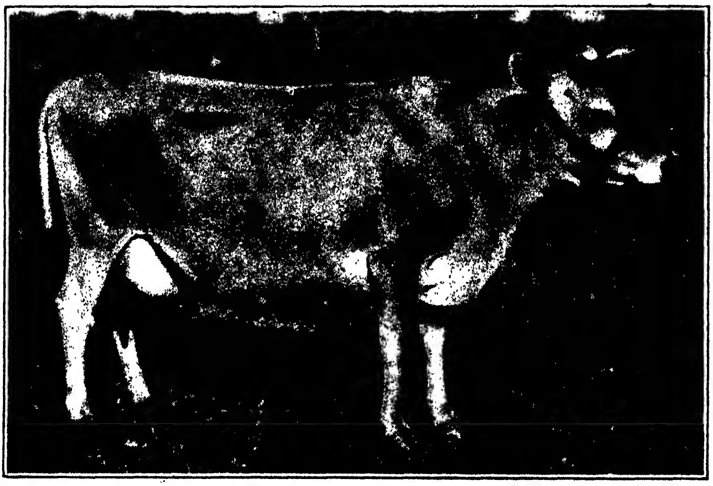
It is a significant fact that, generally speaking, this class of men is divorced from the calling, and the problem for Governments is, why?

"Mutual Confidence."

Mrs. T. Mesley and the top heifer, "Agnes of Warenda," which yielded 527·20 lbs. butter fat on first calf, and 497·72 lbs. on second calf.

When this type of man preponderates on the farms the industry can be regarded as having been saved. If a larger representation of such men could be brought about, this herd test, and similar movements, would be far more speedily effective. Good managers there are; we meet numbers of them. But it seems that the industry of dairy-farming is dissolving itself into either the very smart or very dull, and it cannot be gainsaid that it has more of the latter than is good for it. The successful men win through to their prosperity only by unsparing devotion to the business, as well as the labour side of the calling. They all possess a certain wide-awakeness, not necessarily paraded, that enables them to sense quickly what pays, and they adhere

to a practice or an article of plant—animal or implement—only as long as it proves itself profitable. They themselves are the keenest critics of their own methods. On the other hand, there is the larger class that is practically proof against all innovation; good unskilled labourers, but incapable, apparently, of comparing forms of investment, and quite ignorant of what a proposition should return to be "paying." Where a business-man would refuse to continue without at least 6 per cent. interest on the capital outlay and a manager's salary, clear over all working expenses, including wages for all engaged, these stolid farmers hold on, unimproved and unimproving in most cases, through sheer inability to calculate what their business is really returning them.



Mr. P. J. Maloney's "Czarina of Springhurst."

(Born 16.4.14.)

Season.	Milk lbs.	Test.	Butter Fat. lbs.
1916–17	5,411	5·34	289·15
1917–18	6,692	5·72	383·17
1918–19	5,961	5·37	320·49
1919–20	7,063	5·53	390·75
1920–21	7,507	5·39	404·60
1921–22	9,637	5·47	536·84

It is hard to blame any one for ignorance, seeing that it herein exacts its own penalty, but it is doubtful if they would long persist in an occupation for which they are by nature so unsuited, if it were not that the same dull-wittedness which incapacitates them as dairymen also precludes them from comprehending what labour, no more skilled than theirs, is commanding just "over the range."

The passive resistance which any step for the industry's betterment meets with in this well-represented but difficult class, is the greatest obstacle that the "better stock" movement has to overcome. In view of the indifference of this numerous "ruck," which promises nothing better than stagnation, the State cannot afford to discourage progressiveness when it appears, and particularly the fine example set

by a number of the younger generation of dairymen, returned soldiers among them, who seek the services of the herd-test and welcome the advice of its officers. Nor can it afford to miss the opportunity for progress which the pure-breeders' willingness to submit their stock affords. The State wants bulls pure as well as proved; numbers of them. Not having material from which to furnish them itself, the offer of the existing pure-bred herds as a source of the right class of animal is very acceptable. In accepting the offer the Government was not concerning itself with the interests of the pure-breeders, as such, at all. The non-progressives of the industry are glad of any pretext for not approving an innovation, and some profess to believe that this herd-test movement was a cute scheme of the pure-breeders to sell their stock. This is a baseless assertion, not justified at the time the test was initiated, and which has not a single selfish action by any of the founders to support it, before or since the test began. In fact, its founders have always objected to its being exclusive—not a selfish objection by any means. Any pure-breeder who loyally conforms to the conditions imposed by the State is performing a public-spirited action, inasmuch as he is submitting his property to the State to be used as an instrument for national gain, in the knowledge that he can hope for reward only in proportion as the material he provides is the sort the State desires. No one doubts, nor does any one of them deny, that he hopes to be recompensed in the increased demand for good stock, but that can never eventuate to one till he produces the good stock and thus serves the State well. A testing herd-owner cannot afford to breed duffers, for the searchlight of the test exposes these as effectually as it advertises the worthy. That there are breeders who are willing that their cattle shall stand on their merits alone or fall, is fortunate for the State, and surely to the credit of the men themselves. To begrudge them whatever monetary gain is theirs, from thus making better and ever better animals available to dairyman throughout the State, would be, surely, no less mean-spirited than "muzzling the ox when he treadeth out the corn."

Is Heavy Milk-yielding Quality Hereditary?

As long as there is anything in the theory of heredity (faith in which is growing rather than wilting), testing is cheap at any cost ever likely to be incurred. Whatever the testing owners may win from it, the gain must be infinitely greater to the industry in general. Putting heart into the workers in the outposts is surely good national policy, and there is not an officer connected with the herd-testing work but wishes that its greatest gain may go to the general dairy-farmers, wherever they may be, who have the "nous" to pluck the fruit to which the herd-testing is but the inviting ladder.

By our testing and recording, any dairyman with the will is enabled to ascertain which animals are most likely to carry the valuable quality of milking heavily, richly, and long—the attribute which gives value to a dairy cow in proportion as she possesses it, and which we hope to make a constant character, always transmissible to the progeny. This is not yet quite possible with our present stock, and with some breeds less than others. But notwithstanding the present limitations and the occasional disappointments, there is no weight of opinion contending that

one is as likely to get good milkers from non-milking mothers as from heavy-milking ones. The first essential is for one to know what class of animal he is working on, and this is the part that this herd test is going to play. When we have found the high producer we cannot yet insure that she, however mated, will transmit the quality to her offspring, but we do know, even now, that she stands a much better chance of doing so. Advocates of breeding by selection believe that the uncertainty can be whittled away, generation by generation, to eventual elimination, if only such animals as are pure for production be bred from. It must be some time before the motley cattle at present composing the general dairy herds can be brought to this stage of development. There is hardly an owner, however, who cannot straightway afford to take the initial step by concentrating on the bull.

Mr. H. Luxton's "Captor's Thora."

(Born 22.5.12. Formerly owned by Mr J. Scott.)

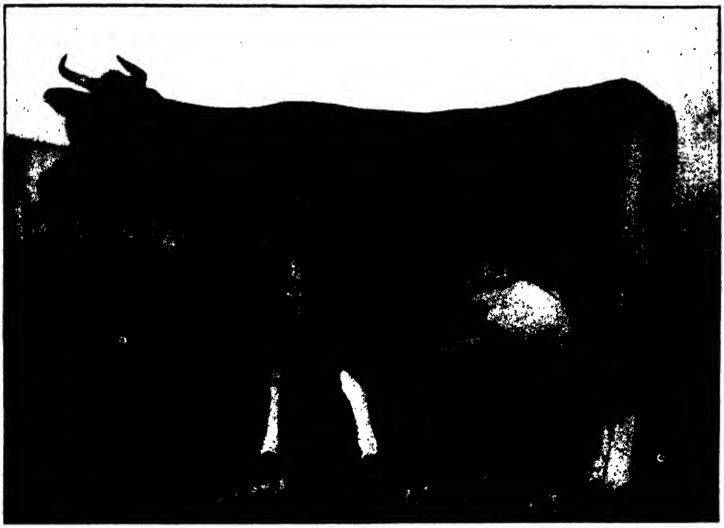
Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1917–18	7,398	5·46	404·09
1918–19	7,334	5·55	403·87
1919–20	5,155	5·24	270·25
1921–22	8,583	6·06	520·42

Sufficient is known about the laws controlling heredity, or inheritance of character, in plants to indicate the line that should be followed, but the difficulty is to apply the principles to the somewhat different and more tedious reproduction of cattle. But we have the satisfaction that more is being discovered on the point every day through experiments which, in one place or another, are constantly being conducted.

In the limits of existing knowledge, dairy-farmers, in selecting a bull, cannot be expected to do much more than insist that the desired quality should exist in at least his dam and his sire's dam. Of course, the more antecedents possessing it, the better—continuity in the generations is very convincing. If one can only do so, it is better still to know that the bull has already been transmitting it to his

heifers. This enhances a sire most of all, because it makes for certainty; the ancestry gives only the hope; the progeny is actual consummation. Consistently good progeny is a real virtue in a sire, to which everything else might reasonably be subordinated. The owner of such a bull might well be the envy of all dairymen. Yet instances are known of such bulls going early to the chopping-block at ridiculously low prices. Why? Through the owner's folly in not testing his cows and consequent ignorance of the bull's real worth—a fatality of the common conceit of "judges."

Hoard's Dairyman recently gave the instance of the Jersey "Stoke Pogis 3rd," one of America's most prepotent dairy bulls, sold to a butcher for 30 dollars, while an agent was chasing after him with an offer of



Messrs. Lyon and Kerr's "Molly of Clover Flat."
(Born 3.11.15.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1918–19	6,510	6·20	403·81
1920–21	8,499	5·87	499·07
1921–22	8,943	5·84	522·36

1,000 dollars—too late; a premature sale and a premature slaughtering, the money loss of which could not be estimated. But it must not be forgotten that there are also bulls the money loss of rescuing which would be equally difficult of estimation. Stoke Pogis 3rd was the progenitor of a whole family of high-producing Jerseys. He was a pure-bred dairy bull in all respects, from which the element of chance had been eliminated by close attention to the laws of breeding. He was all of a piece—the result of transfusion after transfusion of the desired quality, or rather the elimination after elimination of undesired qualities, right down his pedigree.

The "make-up" of our old familiar "scrub" or mongrel bull is very different. In him are variations innumerable. Using him on

good cows is a definite step backward, and on poor cows is but to perpetuate defects unending. If variety, in its entirety, were being sought, he is the sire *par excellence.* As a disturbing element and upsetter of calculations in the kingdom of kine his class stands alone. To let the blood of such an animal get mixed up with that of any other, from which breed improvement is expected, is like attempting purification by adding contamination. He possesses no factor in sufficient degree to mark anything he begets, unless his own objectionable characteristic, instability, can be so called. A mosaic of multifarious types himself, he multiplies the variations with his progeny, and in so doing, scatters broadcast the very tendency it is the whole art and concern of the breeder to overcome.

The making of a pure-bred is nothing more than the abolition of this tendency of variation, which so utterly unsuits a bull for sirehood. But far faster than our progressive breeders can breed it out, our "scrub" bull-owners let it recur by default. It is a race for supremacy between good and evil. It would be something achieved for the better if the average dairy-farmer could be persuaded only thus far, that if feeding does not pay it is because his cows are what they are, and his cows are what they are just because he is not giving the attention he should to their breeding. The readiness of so many to use any kind of male ox to sire their dairy heifers, forces one to the conviction that a large proportion of the dairy-farmers have not yet learned what the word "pure-bred" means. It would be well if they could know that the cattle which have been raised to the status of pure-breds came into being as a result of the demand for better-quality animals, and became entitled to the name only after many generations of select mating. The result is that, whereas the desired character may occasionally occur in a cross-bred animal as a matter of chance, and goes no further, it is in pure-breds the product of design, to be passed on. In breeding young dairy stock it is loss of both time and money for the breeder to tolerate a mating that does not give him sound reasons for anticipating what characteristics the progeny will possess. The points which have been preserved in the pure-breds are, in the main, virtues, and at least nothing which is positively detrimental to the animal's value has been willingly retained. The desired characters have been so often included, and the undesirable so consistently rejected in the evolutionary process, that the resulting product has come to take the form and character of the material it is made of. The only thing that prevents such animals from being more generally adopted is the apathy of the very class which would derive the greatest gain from their use.

There is hope in the educational effect of the Herd Test, for the roots of the farmer's apathy have their hold in nothing but ignorance. No man is so bad as to be breeding scrub bulls with that deliberate and definite aim. They are simply the outcome of "letting things slide," which is, after all, more frequently due to mental than to muscular sloth. The owners might know something is pinching them, but it does not occur to them to suspect their "scrub" bull. The men themselves do not realize that there is as much need to protect themselves in the matter of procuring their animals as there is in the purchase of manufactured goods. When buying the latter, are they satisfied with anything at all?

Does not any man of sense prefer to patronize a trade mark of repute? Which of them is prepared to accept any yellow metal as eighteen carat gold? At any rate, not one of them is so foolish as to repeat such an error; yet many go on year after year depending on a "brummagem" sire—a sire that is no better than unstamped jewellery or an article on which the maker is ashamed to put his name. Hence the numerous scrub animals there are, masquerading as dairy cows, and hence the numerous unprofitable butter fat returns, far more numerous than necessary, which all arise from sheer neglect on the part of the victims to learn the A B C of the stock husbandmen's calling, as old as the calling itself, that one cannot gather figs from thistles.

There is but one way to make general the class of cow which will give high interest on the outlay which her keeping involves, and that is

Mr. T. Mesley's "Gazelle 2nd of Warenda."
(Born 27.7.16.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1921–22	9,601	5·35	513·67

to breed her on test data. Would that there were an easier way! Disappointments in the process of breeding up there may be, but in the main it will be one of progress, and it can be anticipated that whatever occasional setbacks may be experienced, these will become so rare as to be insignificant once the blood of the breeding animals has become fully infused with the right principle (of production).

Some breeders are soon needlessly discouraged by their young stock failing sometimes to inherit the expected character. In the present imperfect state of the breeds this cannot be guarded against absolutely. It is the price that has to be paid to discover the impure, and it is part of the process of detecting the pure and desired character. It means that certain ingredients have entered into the product in this particular gestation that were foreign to the principle; and this, notwithstanding

that perhaps both the parents possessed in themselves, as far as could be externally judged, the particular characteristic that was desired in the offspring.

Mendelism in Breeding Dairy Cows.

This is far from being in conflict with the laws of heredity as they apply to an unfixed character. If such a setback shakes a man's faith in the scientific theory of heredity it is because he has been interpreting too literally the saying "like begets like;" so commonly used to express the principle. That like begets like is true only of mating two similar animals in which the principles have been "fixed," or in other words, are pure characters. Of course like begets like inasmuch as the offspring of cows will always be calves, but not until the breeder's art had been applied could it be promised that certain attributes possessed by the parents would be reproduced in the calf.

Now we can safely predict that a certain character like, say, colour and hornlessness will recur in the offspring. We look forward to a black and white colour in the Friesian, but only because the parents are pure to the character, and the hornlessness of the Red Poll is similarly assured, provided that pure parents are used; likewise, a true Ayrshire from Ayrshire parents, and a true Jersey from Jerseys. This much was achieved by breeders selecting long ago only those animals for breeding, which were possessed of the particular type that they desired to perpetuate in the breed. As far as certain breed points are concerned they have now become bred in so intensely that like will unfailingly produce like at practically every asking.

Thus far (that is with pure characters) the claim that like begets like needs no qualification. Neither has it to be qualified as a general principle, because it is equally certain that if the practice of exclusively selecting one desired quality be pursued long enough, reproduction of that character can eventually be made a certainty. Even starting with cross-breds or nondescripts, by breeding only from the individual descendants that conform to the type aimed at, and rejecting all others. it is only a matter of time and patience till every animal born is not only like the original specimens, but also able to transmit the character in unfailing genealogical succession. More time, of course, would be required, and many, very many, of the resulting animals, in the early stage especially, would have to be discarded as useless for the purpose.

And so it is, in breeding for an unfixed character like high butter-fat production. This will not deter any breeder who has even a slight knowledge of the Mendelian law of heredity, by which the course of character descent is determined. All characters do not act similarly because all characters are not equally fixed, and consequently much experiment and observation will be necessary before it can be predicted exactly, how the character of high production behaves in the generations when systematically bred for. There are some simple single characters which can be directed any way by mating them according to Mendel's law, which governs their heredity. A statement has recently been published that test and milk yield can be classified into two separate and distinct Mendelian characters. If so, important results may be looked for.

Mendelism teaches that, provided the character is a Mendelian one (that is, behaves as certain characters did under Mendel's original

experiments), and provided the right male and female can be identified and mated, the course that the character will take in the different offspring can be pre-determined. If there is one thing striking in the operation of Mendel's law more than another, it is its revelation that there are certain animals (impure dominants) which, when mated, must by nature throw a percentage of offspring unlike themselves. This is of special interest to dairy-cattle breeders because it means that good animals in themselves are not necessarily good animals to breed from. This makes for difficulty in fixing a character, and this is what embarrasses so many animal breeders—two parents equally well possessed of a character themselves, failing to beget similar offspring. Animals which

Mr. C. Deverell's "Brighton Princess of Springhurst."
(Born 17.4.16.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1918–19	5,325	5·51	293·18
1919–20	5,327	5.06	269·76
1920–21	5,266	5·34	281·49
1921–22	9,208	5·52	508·73

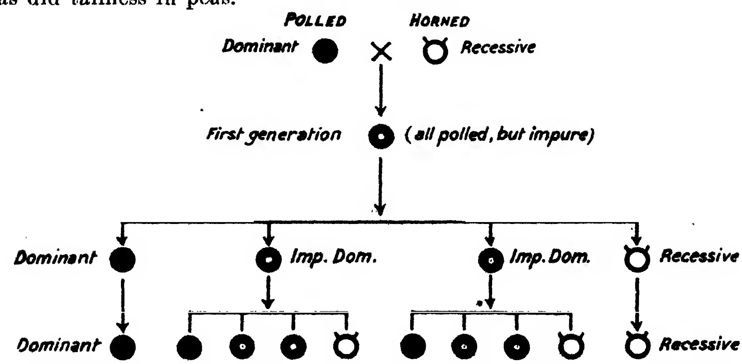
consistently mark their progeny with their own likeness are commonly known as "prepotent."

Mendel's discoveries throw a great deal of light on what brings about prepotency. Many experiments with very many specimens eventually led him to class characters under but three headings—"dominants," "recessives," and "impure dominants."

These terms must not be understood as referring to a whole animal with its complex structure. This was Mendel's first helpful idea—the hopelessness of regarding the whole complex organism as a single unit. There are many characters combined in one animal's "make-up," such as colour, size, shape, and innumerable others. Each particular character must be taken singly and dealt with as a separate unit in itself—either dominant, impure dominant, or recessive.

One of Mendel's most simple experiments in plant-breeding may be given as an illustration. Taking tall and dwarf pea plants, he cross-fertilized the flowers, and in due course sowed the seed thus fertilized. All the progeny came tall—there were no dwarfs whatever. Tallness was thus proved to be "dominant" and dwarfness "recessive." Although these tall offsprings lacked nothing visible as specimens of the true tall pea, contamination had none the less entered, and was but waiting for the progeny. These apparently true tall plants were allowed, on flowering, to self-fertilize (that is, tall with tall). The result was not all tall plants, as might have been expected, but tall and dwarf, in proportion of three tall to one dwarf, but none of intermediate size. This was a remarkable result, in view of the fact that crossing tall and dwarf had given all tall as progeny. It was further noticed that this proportion (3 to 1 approximately) repeated itself every time the experiment was made. Each single plant was then allowed to self-fertilize in the natural way. One tall out of every three bred true, giving all tall progeny; the dwarf bred true to dwarfness, while the progeny of the other two tall plants split up in the same proportions as before, viz., three tall and one dwarf and nothing intermediate. The eye could detect no difference between the tall which bred true and the two that did not. But it was so, and occurred every time the impure dominants were self-mated, viz., one pure dominant (the tall, which bred on), two impure dominants (tall plants, which split up their offsprings), and one pure recessive (dwarf, which bred on).

Tallness and dwarfness thus showed themselves Mendelian characters pure and simple, the one dominant and the other recessive. The cross-mating of a dominant and a recessive character will always produce all apparent dominants in the first generation, which will, in turn, just as invariably transmit the different classes in the proportion stated. There are animal characters which behave similarly. In Polled Angus cattle the polled character is a true dominant, and if crossed with a horned type will descend as shown in the diagram hereunder, which is exactly as did tallness in peas.



The first generation all come polled, but not pure, as further breeding proves. If mating is confined to these animals of the first generation, the offsprings split up as shown, viz., three polled and one horned. It will be seen that of every four animals begotten, only two possess their

visible character in pure degree (one of the polled, and one horned) notwithstanding that all are of identical breeding, and three are identical in appearance as well. One of them breeds on, true to hornlessness; the horned also breeds on, true to horns; the other two (polled) split up their progeny the same as their parent had done before them. So that of every four animals in the second generation only two possessed the property required by the breeder—prepotency, or the ability of an animal to reproduce its own character in all its offspring. The other two were no better than their parents in this respect, in fact their breeding character and that of their parents are identical, always giving the same proportions of 1—2—1 in every four offspring—one dominant which transmits its own true character, two mixed breeders (impure dominants) like the parent, and one recessive which also transmits the recessive character (unless out-crossed). The impure dominant is ever the same hereditarily unstable compound.

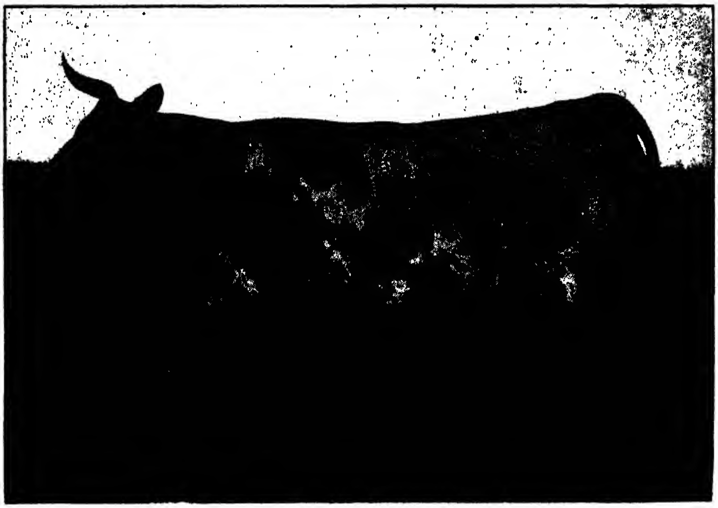
The above is a practically unvarying rule of character descent when two animals pure in the alternate characters are mated. It shows that a plant or animal seemingly true is not necessarily pure, and how it can be proved only by two generations of progeny, either backward or forward. The fact that the first generation of offspring, all carrying the character of hornlessness, were able to transmit it to only seventy-five per cent. of their offspring, and of these latter only one-third, or twenty-five per cent. of the whole, inherit it in fully dominant degree, explains the rareness of prepotency in cross-breds.

It is not contended that the animal breeder has the same chance of using Mendelism as the plant-breeder, but from a study of the above exposition of the law's working, the less experienced breeders for high production may learn how it is that disappointments occur, without necessarily affecting the soundness of the theory of heredity.

It was the same frequency of disappointment which always met any systematic attempt at plant-breeding that led Mendel to his original experimenting, and it is too early to say yet that his discoveries have no application to milk production. Mendel, starting in the first place with the complete or pure article, was eventually able to learn how a simple pure character could be built up, by first separating it into its component parts. He showed the course some simple hereditary characters are most likely to take down through the generations, according to the degree of inherited ability which the parent possessed to give them impetus one way or the other. He located the direction and blazed the trail for all men following, who would observe.

Plant-breeders have already put the discoveries to good use. They, however, have the advantage of being able to select specimens to start with, which have been all along re-producing their own special peculiarity at every seeding. (Would that we could put our hands as easily on a few animals as equally possessed of pure milking character to start with.) Another advantage they have is that all the members of a generation—dominant, impure dominant, and recessive—arrive together, and the third generation, which first reveals the desired specimen, can be attained within three years from starting. Again, butter-fat production is by no means a visible character like, say, tallness and dwarfness in peas, or the hornlessness of Red Polls. After an animal has been born we have to wait for milking age, and then the time requisite for recording

and testing over at least one lactation. By the time this can be ascertained the grand-parent from which she sprung is probably dead. But a greater difficulty than all, besetting the would-be breeder for production on Mendelian lines is the fact that it is a female characteristic which has to be taken practically on trust in the male parent, which he proposes to use. This difficulty can be got over, at present, only by having available as a sire a comparatively aged bull proved by three generations of progeny; but a bull producing the right heifers and having high-producing ancestors for two generations back can, for all practical purposes, be presumed to be pure in this characteristic—all the more so if he should happen to have high-producing sisters as well. This animal



Mr. J. H. Rogers' "Pearl of Riverside."

(Born 25.8.13.)

Season.	Milk.	Test.	Butter Fat.
	lbs.		lbs.
1919–20	7,171	4·42	316·83
1920–21	9,057	3·81	345·59
1921–22	10,794	4·56	492·35

takes some getting, but otherwise we must largely depend on chance for our good animals.

Before the law can be given any intelligent systematic application in practice, it is necessary to know what are the requisite factors which make up butter-fat production. The character is essentially a composite one, depending equally on at least two factors, milk yield and test, or quantity and quality respectively. It might be obtained in an animal of low fat-test, provided the milk yield is inversely proportionate, or it might be obtained with a lower milk yield but correspondingly high test. In either case a good constitution is required, and may be presupposed, because continuous high-fat-production can be accepted as the very best proof of constitution. Some experimenters have asserted, as before

mentioned, that a constitutionally high tester crossed with a constitutionally low tester will invariably result in a low testing offspring. Also that heavy milk yield mated with low milk yield begets a heavy-milking offspring. This would mean that low test is dominant to high test, but high yield is dominant to low yield. The ideal animal, if she could only be found, is one with both yield and test high, and even then she must be able to transmit these qualities. The double character naturally complicates matters somewhat, but that fact only does not make the matter hopeless, because breeding for two characteristics at the same time is quite a common practice of plant experimenters.

To illustrate what happens when this is done, let us once more take Mendel's old subject, the pea plant, but along with the two dominant and recessive size-characters, let us include the colour characters—red and white—and cross the tall red and the dwarf white (although it would make no difference if tall white and dwarf red should be taken). The following diagram (read from left to right) shows the analysis of results, which practically never varies in the average.

Parent Plants.	1st Generation.	2nd Generation.
		—Tall Red.
		— " "
		— " "
		— " "
		— " "
TALL plants, with RED flowers (Dom.) (Dom.)		— " "
×	All Tall Red plants	— " "
DWARF plants, with WHITE flowers (Rec.) (Rec.)		— " "
		— " "
		—Tall White.
		— " "
		— " "
		—Dwarf Red.
		— " "
		— " "
		—Dwarf White.

As usual, only the dominants of each respective character appear in the first generation. In the second generation out of every sixteen plants there are nine tall red, three tall white, three dwarf red and one dwarf white. This makes twelve tall plants in all, and four dwarf ones; twelve being red-flowered and four white, or thirty-two characters, altogether, in sixteen plants. The dwarf plants all bearing a recessive (dwarf) character, could be nothing else but pure in that character; similarly with the recessive-charactered four whites in the colour character. But tall being a dominant character, there is one pure (dominant) tall and two other (impure dominants) talls for every dwarf, so that in the twelve tall plants there are only four pure to tallness, the other eight tall ones being mixed breeders for this character of size. The same rule applies to the twelve red (dominant colour) plants. It appears intricate, but the rule is nevertheless there. Without wishing to pronounce for or against the theory of production in milking animals being made up of two Mendelian characters (time will tell), there are a few things which suggest themselves as practicable if it should be so.

Presuming high test and low milk-yield to be the two recessive characteristics, then—

(1) If a bull never begets a low-testing heifer when mated with a high-testing cow, he would be thus proved a recessive in the test character (a high-test animal), because if he were a dominant (low-test), even a high-testing cow could not throw a high-testing heifer to him. (A recessive can never reproduce its character when crossed with a pure dominant). That would be one way to prove if a bull had high-test character.

(2) If the same bull never leaves low milk yielders from light-milking cows he must be a dominant (high yield) as far as milk is concerned. He would thus be the bull everybody wants—high yield

Messrs. Kerr Brothers' "Morven Queenie 8th."
(Born 5.3.14.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1920-21.	8,701	3·92	341·00
1921-22.	11,581	3·82	442·12

and high test combined. Poor cows could be systematically used thus to test the prepotency of a bull. And once it is known in what degree a character is possessed, the standard can always be kept.

(3) If a bull never gets a high-yield animal from low-yield cows he must be a yield recessive (low), and necessarily not much good, unless he compensates for it in test character.

(4) If the same bull never gets a high-test animal when mated with a high-test cow, he must be a dominant (low-test) as far as test is concerned; and consequently proved doubly bad, lacking both yield and test character. If (and it is a big "if") high milk yield and low milk yield are really dominant and recessive Mendelian characters respectively, and if high test and low test are similarly related (but the high character recessive and the low dominant

in this case), then, with our herd test data to help, we ought to be able to prove the character of a bull by experimental mating, either on females chosen for their combined low yield and high test (double recessives) or cows possessing either of the characters. In any case such experiments would soon show whether there is anything in the theory as stated.

The improvement that breeders have already effected in the milking function of cattle leaves practically no doubt at all that production is an hereditarily transmissible character, and consequently subject to Mendel's law of heredity. The examples above are given only on the assumption that it is of the simplest form of Mendelian character, which it probably is not. The thing that breeders have mainly to fight is that invisibly unstable compound—the impure dominant. Except by breeding on further there is no way of distinguishing this uncertain breeder from the pure dominant.

Enough has been said to show the connexion, as far as simple characters are concerned, between prepotency and dominance. A dominant character is always prepotent, but a pure recessive can be quite prepotent with a recessive mate; 50 per cent. prepotent with an impure dominant mate; and lose prepotency altogether in the first generation when it meets with the pure dominant. However, although a run of prepotency may not prove an animal to be dominant in the character, it certainly does prove it pure in the character. Unfortunately all unit characters cannot be classified into simple dominants and recessives. There are some which appear to be ramified into greater complexity by the sex element.

To take an instance, there is the horned character of sheep which, when crossed with hornlessness, has a habit of inheritance altogether more complicated than that of the same character in oxen. (This may be read in Punnett's "Mendelism".) In Dorset sheep both sexes are horned. Suffolks are not horned at all. Whichever way these two pure-breeds are crossed, the result is the same—the ram lambs are horned and the ewes hornless. Mating the males (horned) and the females (polled) of this generation gives both horned and hornless males, and horned and hornless females, but in very different proportions. Among the rams nearly three-fourths are horned, but of the females, three-fourths are polled. Thus the difference between the horned character in the Dorset sheep and that of oxen is not only in its being dominant instead of recessive in the first cross, but also in being affected by sex.

Sex-linked characters are of special interest to dairy-cattle breeders, because of the prevailing belief that milking character comes from the sire and is transmitted to his heifers mainly, or perhaps only. This has not yet been verified. Too little is known of the real degree of heredity possessed by the character of butter-fat production. There is certainly too little known to enable the breeder to derive much systematic help from existing knowledge in breeding his dairy animals. Whether the breeder is conscious of it or not, his art is nothing more than exploiting the laws of heredity or reproduction, and a more exact knowledge of the subject must be of service to him in the conduct of his operations.

The foregoing simple exposition of its action with regard to some simple plant and few animal characters will have fulfilled its purpose if it makes the apparent vagaries of character-descent in milking animals

(which the best of breeders occasionally experience) more understandable. The remarks are designed to impress on breeders the fact that inheritance of milking function is a question of individuals, and of the gametes (germ cells) at that, rather than of the entire animal organism. Identity of appearance is no sure guide to breeding merit, even when breeding for a visibile character like horns, let alone a comparatively elusive character like milking function.

Two individuals similarly bred, and indistinguishable in outward appearance, may have entirely different breeding propensities. This is the law's teaching.

The application of Mendel's law to animal breeding means concentration on one character at a time. Experiments first on small fast-breeding animals like rabbits may be the obvious policy for visible characters, but can give us practically no help towards milking character.

Mr. T. Mesley's "Garenne 4th of Warenda."
(Born 15.8.19.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1921–22	7,180	6·05	434·35

If the law is ever mastered we shall be able to breed a beast pure to the degree of prepotency in two generations, and pedigrees any further back will become superfluous as far as that particular characteristic is concerned.

In the meantime, there is no reason whatever to doubt that all character inheritance is determined by natural law as certainly as is the course of a river; but the law as it pertains to animals is extremely intricate. Plants offer the simplest field for experiment, and, perhaps, with animals, more success will come from connecting known plant-successes with our existing experience of animal breeding, rather than from any forward experimenting which could be conducted with animals themselves. Mendelism is but the small discovered part of the laws of breeding. The greater unknown part bears no special name as yet, but it is there. The Dorset and Suffolk sheep experiment did not follow

the ordinary simple Mendelian rule, but, nevertheless, there was law operating; else why did the first-cross result recur time after time whenever the horned Dorsets were crossed with the polled Suffolks?

There is, just as undoubtedly, a law controlling the inheritance of udder capacity. It is possible that even now a close-detailed survey of our herd-test records would do something to reveal it; and some investigation would certainly have been made before this to either establish or explode the theory of test and yield dominance discussed above, had there been time to spare from the ordinary routine test duties. Time will not detract from the value of the accumulating data. In fact, the record of yields which is being built up now will be even more valuable to the breeder of the near future than to those who are finding it so useful to-day. If the test continues, it is only a matter of time till every herd-book cow in the State is the bearer of a yield-label, along with her herd-book number, and it will need to be quoted just as frequently. This will make a cow's producing capacity practically a visible character, or at least as reliable to the breeder as if it were.

Animal breeding on Mendelian lines almost necessarily implies in-breeding, or at least a modification of it, in the early stages however. This cannot be a fatal objection, because close breeding is not necessarily out of accordance with good dairy practice. Already experience shows how frequently close-breeding has been responsible for speedily and effectively fixing a desired type. In-breeding has been likened to dynamite—it will either "do or damage," according to the handler. To show that it need not do all damage when the breeder is a master-hand, there is the well-known old-time successes of Bakewell, the Colling's Brothers, Bates, and many other subsequent, but equally successful, breeders in England, who practised it to more or less extreme lengths. Who ever heard of a more closely-bred animal than the world-famous Shorthorn bull "Comet," bred by the Collings? Of course, we do not know how many animals were damaged before this superb specimen of the English Shorthorn was attained. "Comet" was as in-bred as he was perfect. This is how he was bred: The bull Foljambe was mated with Lady Maynard and got Phœnix, and with a daughter of Lady Maynard and got Lord Bolingbroke. Then Lord Bolingbroke and Phœnix were mated. This was the first close step—putting a bull on his own mother's half-sister, which was also his own father's daughter. The result was Favourite. This bull, thus close-bred already, was put back on his own mother (Phœnix), and got a daughter, Young Phœnix, which, mated back with her own father (Favourite), produced Comet, than which there has never been much better.

Lady Maynard x Dalton Duke
|
Foljambe x Lady Maynard   Young Strawberry x Foljambe
| |
Phœnix———————— x ———————— Lord Bolingbroke
|
Phœnix x Favourite
|
Young Phœnix x Favourite
|
Comet

What makes it all the more remarkable is that Comet's full brother, the "Durham Ox," was an equally fine type of animal. Another of the most-renowned bulls of England, Bates' Duke of Northumberland, was got by putting the bull Belvedere on to his own daughter. And there are many other English examples which could be cited.

To come nearer home, there is the instance of the "Darbalara" shorthorns in New South Wales. That fine cow Melba, 7th of Darbalara, which yielded 869½ lbs. of fat in a season, was the outcome of putting Emblem on his full sister's daughter. Nor did Mr. Cole stop at that. He then mated this close-bred daughter of Emblem's with a son of Emblem (half-sister and brother), and the result was Melba 15th, as robust-looking a cow as her mother, and, more important than relative looks, a still higher producer. When bulls as closely bred as "Comet" can become champions of England, and cows as closely bred as Melba 15th of Darbalara yield 954½ lbs. of fat in a season, it certainly seems that the breeders seeking to achieve the ideal dairy cow need never decline the short-cut that Mendelism might offer just because of its involved necessity of in-breeding. Of course, it is recognised that in-breeding intensifies defects as well as virtues, and unless a breeder can be sure that the animals are good enough to stand it, he had better go no further than the occasional introduction of a typical member of a related family. The novice would be well advised to confine himself to one close mating, and never using any animal showing any sign of degeneration, especially one that is itself the product of close-breeding.

It is much safer to use a close-bred male than a close-bred female. A male escapes the additional strain on the system that maternity imposes, and it is significant that most of the well-known successes are the result of mating animals whose relationship is through a common male relative rather than a female. If half-brother and sister are to be mated, it is better, as a general rule, to have the relationship through the father. The same applies when mating uncle and niece or aunt and nephew. The *Journal of Genetics* (April 1921) contains a record of experiments which would indicate that close-breeding through a male relative increased both yield and test; whereas a female connecting link gave no improvement in test worth mentioning, and actually reduced the milk yield; but the number of animals used was hardly sufficient to make the tests conclusive.

The Absolute Necessity of a Good Bull.

Breeders should first satisfy themselves on what it is that their animals mostly lack, either of test or milking capacity, and then keep their eyes open for a bull, of either their own or some one else's breeding, which transmits the character. Failing this class of animal, one should use a bull which, on his breeding, can be presumed to be carrying the character, and try him out with decent cows by keeping both the dam's and heifer's records. If the heifers show an improvement, prize the sire accordingly—even to "far above rubies"; but if his heifers are no good, discard him immediately, and stop his mischief before it has become really serious. Assess the heifers' merits according to their money value as producers and potential mothers of producers, and not by how they comply with a fancy scheme of farm decoration. If the heifers are a success, judged on these lines, it would then be fortunate

for the owner, if the sire happened to be a product of close mating, for the quality of the heifers is far more likely to be stable. For this reason, in-breeding might well exterminate a whole stud as long as the process produced one superbly prepotent animal. In the hands of the right man, one such bull alone could restore far greater glory from the ashes.

The trouble is, men do not really know their bulls. They chop about so much in the sires they use that every one else also is prevented from knowing. It would be good if breeders would keep to one bull till they knew his character one way or the other. It would furnish everybody with a much better basis on which to determine the relative prepotency of the dams, and nothing whatever would be lost as long as the bull's results were kept under sufficiently close herd-test observation. It would, perhaps, mean the early destruction of many perhaps shapely animals, but far greater gain in the fuller use of the rare animals which the system would discover and preserve, to say nothing of the valuable time always lost in using one bull to put on a bit of shape and another to keep in the milking character.

Feeding.

No matter what success one may attain in the direction of breeding, it will never serve to reduce the dairyman's obligations in the matter of food supply. In fact, the whole object of better animals is a better means of transforming fodder. The cows, after all, are just machinery he incidentally uses to convert what he grows into what he sells. If it cannot be increased in value by the conversion process, he had better sell the raw material (fodder) instead of troubling to manufacture it into milk or butter-fat. But if the machine is capable of output of more value than the food it takes to get it, then the more fodder put through the machine the better.

Really, then, do all milking cows require fodder? What would the average farmer think if some one, with eyes gaping in astonishment, should ask him this question? He would at once sum up the questioner as a fool. But the average farmer himself is no more superior to such a jackanapes, than our leading herd-testing owners are to the average farmer. The cow is the farmer's machine just as the printer has his machine, or the weaver, or the miller. The printing machine cannot work at a profit without paper, the weavers without wool, nor the millers without wheat. But the average farmer thinks that his machine will work as long as she gets a bite to eat, and does not actually die. He might as well put his cream separator together, light the fire, generate the steam, oil the machine up and then run it—empty. How could it pay a man to do this day after day, with not one machine but perhaps fifty?

Practically this much is done in every herd every day, whether the cows are operating on raw material or not, but the dairyman who knows his business will see that they do not run idle for want of feeding material. No living cow can stop the machinery that operates her. She must have the equivalent of at least fuel and lubricating oil all the time, whether she has any to treat for milk or not, else she will die, or at any rate will be dead for all useful purposes.

Natural pasture, upon which so many cows are made to depend, might be sufficient for the few spring months of the year, to keep a cow's milking machinery running at its full capacity, but outside that period it is a practically idle empty-running machine unless the farmer does what he was meant by nature to do, viz., harvest her bounty and put it by. This is the only part which nature herself will not do, distribute her favours throughout the whole year. She will practically always give either a sufficiency or the means of a sufficiency for every year. But it is only given at her own season. This is the first part of the farmer's art, stimulating greater growth and conserving, to equalize the distribution. But how rarely is it the farmer's habit. It involves more machinery—real mechanical apparatus this time—and this also must be of the right make and design and likewise as rarely idle as possible.

Mr. T. Harvey's heifer, "Empress of Jerseyholm."

Born 23.7.19.

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1921–22	6,890	5·81	400·43

It is no good merely lubricating them up and running them around the paddock idle like the average cow. This part of the working plant must be efficiently designed and kept usefully operating just as the living part must be.

On every farm there are mid-milking hours which give the farmer opportunity to crop and conserve. There will not then be old mother nature's superabundance at one season of the year and scarcity for the remainder, which inhibits a profitable return from even the best of cows. It is not only the lost return in butter fat, but the lower average price which the factory has to pay throughout the year through permanent staff and machinery having to be run so long at less than their full capacity. This adds to overhead charges, and it is the supplier who pays in the long run, although many are incapable of comprehending that it is so. Whatever of the deficiency in our butter fat returns is due to

improper and inadequate feeding, it is safe to say that most of it occurs by the latter. Even land worth £100 per acre has not the means in itself of giving fodder the year round. There must be an act of man.

Our herd test experience has proved that the miserable returns which have disgraced some of the dairymen in the rich Western District, and which do grave injustice to the breed which is unfortunate enough to have such unskilled owners, are due far more to the disappearance of grass than to any improper balancing of protein and carbohydrate ingredient in the ration. It is not difficult to picture how a real milking cow fares in such circumstances. For a few short months her machinery is in the same position as a cream separator fed to its full capacity and doing good profitable work for its owner; thus justifying not only the lubricating oil, but the whole preparatory labour and cost of running. It happens to be nature's season. Then the season advances, the once green grasses dry up, cast their seed and wither down as grass has been doing for untold ages, and will go on doing, "for, while the earth remaineth, summer and winter, day and night shall not cease." But the farmer, who of all men should note this, is not prepared. The milk begins to dry up with the pasture, and soon the cow, stimulated by an appetite that does not wilt, is working desperately, seeking food against time, instead of leisurely assimilating it. Then, for want of the raw material from which milk is made, her machinery is running empty. The remaining broken, dry straws no more than lubricate it. Chasing increases with scarcity. The machinery, now not even sufficiently lubricated, begins to wear away, and the fine machine, once as efficient as the best, becomes a comparative wreck. If the grass returns in due season she will survive, but an impaired instrument, incapable of the normal output for which it was designed. Repeat this disgraceful cycle year after year and we have the art of dairying as it is understood by many of its devotees, who have not yet learned the vital connexion between food supply and milk yield.

That class of farmer should be careful not to select a heavy-producing breed. Good cows in such hands are as much out of place as a watch in a baboon's, and the result, in the event, is also similar—ruination.

There can be no proper interest in breeding for production until one has first learned the fundamental part which feeding plays in the process. If there are people who hope to use or abuse this Herd Test in the hope of its bringing them the breed that will make plenty of milk from very little feed, they have chosen the wrong instrument in pure-bred cattle. The whole system of testing presupposes well-fed animals. Giving it anything else to work on is but wasting time and money. Although all the cows in the test are far removed from the extreme condition above described, the causes, which are responsible for the wide disparity between the herd totals, are identical with those which are operating for success or failure throughout the herds of the State, viz., the nature of the breeding, feeding, and handling of the animals. The difference is all contained in these three.

Three Essentials for Success.

A herd which is not well-bred, well-fed, and well-treated can never occupy any of the top positions in this herd test. There must be no lack at all. A thing has cost nothing if it pays, and all this pays. The other methods, so long and commonly practised, do not pay in these days.

The dairyman needs every pound of butter fat a twice-a-day milked fodder-eating cow is capable of giving. Let the farmer once get enough butter fat and everything else humanly possible will be added unto him. But one omission nullifies all. There are herds known to be well treated and well fed, but still in the background because the animals themselves are inherently incapable of producing. They lack the right "breeding." There are other herds containing cows of high potential capacity, and that are gently enough treated, but whose owners lack a proper appreciation of what proper feeding means. They likewise take a minor place —the fault lying in the "feeding." Then again, there are herds of proved high producers, which lack no food essential but which have nevertheless fallen behind because the handling is not such as to permit the cows to enjoy the unbroken tranquility and composure so essential to the proper functioning of the highly developed food-assimilating and

Geelong Harbour Trust's "Viola of Sparrovale."
(Born 21.1.18.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1920–21	7,788	4·51	351·55
1921–22	9,261	4·69	434·34

milk-secreting apparatus of the modern dairy cow. This failure is one of "treatment."

These three—breeding, feeding, and handling—constitute the dairyman's tripod, on top of which is success, but there will be no top if one leg be missing. "Breeding" includes its hand-maidens—testing and culling. Feeding embraces its accessories—cultivation, food tastes and values. Handling embodies shed design, the art of milking, and everything else that affects animal comfort and composure.

Comments on Herds in 1921-22 Test.

The top herd this year is Mr. T. Mesley's "Warenda" herd of Jerseys, and the second, Mr. J. H. Hunter's "Meadowvale" herd of the same

breed. The first herd came through with an average of 487¼ lbs. including all handicap allowances, and the latter with 448¼ lbs.

Not one essential of the three above emphasized was neglected by either owners, and dairymen generally could not do better than take a leaf out of these knowing men's book. It will be sufficient to detail a few of the factors as they apply to the results obtained in the winning herd. As for breeding, Mr. Mesley's cows are all pure Jersey, bred with the specific object of production. The cows are mainly by three different sires, viz., Skim of Dunalister (1227), Jessie's Handsome Boy (1011), and Carrie 5th's Noble of Melrose (1068); while Silver Fox and Foxy Boy are responsible for one each. None of Skim's ancestors were tested, but the acid test has been put on his stock, and they have come through proved beyond all doubt, so it can be presumed that had his forbears been tested the source of his merit would have been revealed. Skim is by Clementine 2nd's Beau (240), by Carnation's Pride, by Carnation's Fox (imp.), and his dam was Clementine 2nd (326) (imp.) —a good pedigree, made better by Skim's success.

Jessie's Handsome Boy (1011) is a Woodmason-bred bull, going back through his sire Handsome Boy III. of Melrose (710)—a bull noted for high testing heifers—to Pretty Noble (imp.) and a Wild Rover cow Handsome Girl IV. (1063), which was herself a great producer. On the maternal side Jessie's Handsome Boy is a grandson of old Jessie's Progress (3657) (whose records are worth looking at). The daughter which produced him is Jessie XI. of Melrose (3656), which had two crosses of Wild Rover, so that Wild Rover is well represented in him.

Carrie 5th's Noble of Melrose (1068) (a son of Pretty Noble, imp.) is a full brother of First Choice of Melrose (847) (see Mr. Hunter's winning herd pedigrees, September, 1921, *Journal*, and Mr. C. G. Knights' two years before).

With these bulls in mind the breeding of the cows on the maternal side may be usefully reviewed. Agnes of Warenda (527.20 lb. fat) and Meadow Sweet (403.74 lb.) are half-sisters out of Alsyke of Springhurst (a cow of good records), whose grandsire was Graceful Lad of Melrose. Agnes is by Carrie 5th's Noble (1068), and Meadow Sweet is by Jessie's Handsome Boy (1011), both of which bulls link up with Pretty Noble (4626) (imp.).

Gazelle 2nd (513.67 lb.) and La Charme (480.52 lb.), bred by Mr. Brough Smythe, are full sisters by Skim of Dunalister (1227). Their dam Gazelle (5243) (488.59 lb.) was got by a descendant of Brighton King, Silver Fox of Luscombe (1226) (a grandson of Music through her daughter Philomel) being put on his mother's half-sister, Namesake 2nd (5251) (379.95 lb.), another daughter of Music. Old Philomel (now 16 years old) has a record this year of 378.25 lb., and has been as high as 446.74 lb.

Phillis 2nd of Warenda (310.45 lb. as a heifer) is by Jessie's Handsome Boy out of Phillis of Luscombe (421.60 lb.), of Brough Smythe breeding (also a member of the present herd), which cow combines the Skim and Music blood through Phillis' dam Philomel, which was Music's daughter.

Charmian (455.72 lb.) is another Brough Smythe Cow possessing Music blood from both sides, her sire Silver Fox and her dam Harmony 2nd being Music's grandson and grand-daughter respectively.

The young cow Music of Warenda, at present in the herd, is out of Warenda (517.52 lb.), a half-sister of Charmian's, through the common dam Harmony 2nd. Music of Warenda, being by Jessie's Handsome Boy, of course goes back to Pretty Noble, Jessie's Progress, and Wild Rover.

Ragtime (482.14 lb.) combines the high testing Jessie's Handsome Boy's blood and that of Music, her mother being Pibroch (469.07 lb.), a grand-daughter of Music, by Skim.

Garenne 4th of Warenda (434.35 lb. as a heifer) comes from the famous Garenne 2nd (581.34 lb.), the top producing cow of the herd, and carries also Pretty Noble blood through her sire Jessie's Handsome Boy. The dam Garenne 2nd is a Skim of Dunalister cow from Garenne, which cow goes far back in the pedigree to old Music.

Messrs. Dickinson Brothers' "Queenie of Ashby."

Born 1.9.17.

Season.	Milk. lbs.	Test. lbs.	Butter Fat. lbs.
1919–20.	7,372	4·01	295·89
1920–21.	10,966	4·01	140·29
1921–22.	12,604	3·86	486·95

Little Queen 2nd of Warenda (369.66 lb. as a heifer) and her dam both appear in the herd results this year. The former has Jessie's Handsome Boy blood added to that of her dam Little Queen (467.63 lb.), and the latter is a Foxy Boy cow from Silver Queen 2nd, a cow whose both parents were by Dairyman. So much for the herd's breeding.

The feeding is equally thorough. A visitor to "Warenda" cannot fail to be struck immediately by the high condition of everything on the place, and with the numerous small paddocks, all designed for the maintenance of food supply over the whole year. Mr. Mesley has still a good area under the native pasture, but English grasses occur in the rotation of crops grown on the subdivided areas. Variety is planned,

not only because of the cow's appreciation of occasional changes, but also because land intensely cultivated also appreciates a change and gives practical thanks for it. One can see oats, barley, millet, maize, mangolds, swedes, soya bean, and pumpkins all growing at the one time in certain months, and, better still, the cows enjoying them also.

There is no cessation of cropping operations. Mr. Mesley recognises that there is nothing that is quite a substitute for greenness, and endeavours to have it always available, even if it is only a cabbage leaf occasionally. When the cold is excessive for the more tender crops, there are still green oats and barley or home-grown oaten-chaff to be used. Garenne 2nd was privileged to have some lucerne chaff in addition to the above-named fodders.

Concentrate is used sanely, and variety is maintained in this also. Bran, polly feed, maize, oil meal, crushed oats, linseed meal, and malt combings were the concentrates fed at one time or another throughout the year, as the yields suggested. Mr. Mesley studied the individual taste of the animals. Some cows prefer one thing and some another, and Mr. or (perhaps) Mrs. Mesley is not afraid to indulge them.

The cows never had need to make milk secretion other than a leisurely occupation. Their owner recognises that hunting for the food is his responsibility, and the cows make him the gainer. The great secret here is not so much the total quantity, as the evenness of supply at all seasons. The whole atmosphere surrounding the cows smacks of leisure and tranquility. There is no rushing; in fact the cows have almost to be pushed in and out of the shed, and are lying down contentedly ruminating before they are more than a few yards from it. No scrambling for respective bails; no horning; no dogging. Cosily rugged and with shade plantations of pines provided, the bleak wind from the coastal sand-dunes has no terrors for them.

Good clean water is always accessible in paddock-troughs, and last, but not least, the cows are always milked at regular hours, and speedily and thoroughly, yet gently withal. And this, then, is how records are made, under this herd test, and not a single feature savouring of abnormality through it all.

One thing that cannot be tolerated on this farm is an underfed animal, either while milking or dry. Like all the most successful men, Mr. Mesley would be ashamed to call himself a dairyman and have a hungry animal on his place. If a cow will not pay for full and liberal feeding Mr. Mesley would rather some one else owned her, and there is no reason why he should not. The cows are deprived of no chance, and then the test determines their fate. It is no good of men holding fast to cast-iron ideas of feeding that were formed back in the dark ages when cows were not capable of yielding more than fifty pounds of butter fat a year, however fed. Those cows had no use for it, and the effect on them would be only that of a drug. For a man to admit to-day that his particular blood will not stand feeding, it is not very far from confessing that they do not carry the first requisite of a dairy cow. A dairy cow that will not stand feeding is little less absurd than a water spaniel that will not stand water.

It is not denied that excessive and over-rich food will sicken and perhaps, kill an animal, if persisted in, but prizes in this herd test will never be won nor will money ever be made by either sick or dying cows. In fearing to feed, people are confusing liberal feeding with

rich feeding. Heavy or liberal feeding is not likely ever to do a heavy-milking cow any harm provided the proportion of the fatty and proteid ingredients in the ration is kept within bounds. If a cow has the liver and kidneys that a good dairy cow must have, there will be no sickening through excessive quantity as long as increase of proteid ingredient is incorporated in the ration with its fitting accompaniment of roughage and carbohydrate, as represented by foods like grass (green or hay), oaten hay or chaff, maize (green or ensilage), millet, mangolds, pumpkins, swedes, chou moellier, &c. Of course, great care and close observation should be exercised in feeding oily foods like linseed meal, coconut meal, and maize oil meal, when 3 lbs. per day is being exceeded.

Review of the Year's Work.

As was anticipated by its founders, the operations of the Standard Herd Test continue to grow. It is obvious that the time is now near when the usual 64 pages of this *Journal* will be insufficient to contain the records alone. Compared with last year's number the increase in herds this year is as 87 is to 129 or 48 per cent; in total cows tested, as 832 is to 1,193, or 43 per cent.; in cows attaining the standard, as 647 is to 947, over 46 per cent., a growth which speaks well for the validity of the appeal which the test is making to the breeders to "play the game," by presenting the producing capacities of their cows for the free scrutiny of all men. This year's report completes the first decade of Departmental testing.

The following is a record of the Test's expansion, and may be accepted also as indicating the rate of pure-bred development in this State, because pure breeding and testing now advance hand in hand:—

Year.	No. of Herds.	Average Size of Herds.	Cows Completed.	Cows Certificated.	Best Herd Result (on Handicap Basis.)
1912–13	5	12·4	62	45	275·45
1913–14	16	13·6	217	156	376·94
1914–15	21	16·2	335	225	429·58
1915–16	16	14·1	225	181	403·05
1916–17	21	12·9	271	236	424·48
1917–18	30	12·1	364	337	416–57
1918–19	52	9·6	499	450	447·70
1919–20	76	9·1	695	560	439·56
1920–21	87	9·6	832	647	445·96
1921–22	129	9·2	1,193	947	487·19

The 250-lb. Class.

The position of Annual Champion Cow has been won for a second time by our old familiar, Rarity VIII. of Melrose, with a record of 647.11 lb. of fat, a fitting performance, especially after a yield last year of 503.65 lb. (her unlucky year), and 718.58 lb. the year before, when she was Annual Champion. To make it all the more creditable Rarity has calved again ten days under the twelve months from her previous calving. This fine Jersey of Mr. Hunter's is two removes from Pretty Noble (imp.) through her sire Lady Melrose 2nd's Noble. She is out of Rarity 6th of Melrose (450.77 lb. fat), a Wild Rover cow,

from Rarity 5th (429.06 lb. fat), so that she comes from no mean ancestry. Mr. Hunter has her daughter (Rarity 11th of Melrose) also, which has a second-calf yield this year of 402.61 lb., and a heifer record of 364.84 lb.

The Reserve Annual Champion prize goes to Mr. Waite's five-year-old cow Dominion Segis Fobes—the Friesian, which created so much interest when she figured so well as runner-up in the *Weekly Times* butter fat contest at the Royal Show last year (1921). She is a New Zealand bred cow ex Jessie Fobes Beets by Woodcrest Jo, thus being a full sister of Dominion Woodcrest Beets, the present champion Friesian bull of the North Island of her homeland. In her case Mr. Waite took whatever advantage might accrue from thrice-a-day milking, which had been made permissible in case of cows yielding sixty or more pounds of

Messrs. W. & G. Finn's "Valda's Queen of Somerville."

(Born 2.9.17.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1921–22	9,277	5·01	464·41

milk daily till they fall to 50 lbs. As she never yielded less than this quantity daily she was milked three times a day through the whole lactation.

Though missing the two top places with his cow Garenne 2nd, Mr. Mesley has as good reason as any to be proud of this, his star performer. She has put up this year 581.34 lb. of butter fat, succeeding five previous yields made up of 282.9 (as a heifer), 371.76 (post heifer), 408.29, 407.16, and 576.80 lb. respectively, all within a period of five years and

eight months on the calendar, and four years and six months of actual milking. All six calves were normal and healthy, and the one which has come into this test as Garenne 4th of Warenda has completed her lactation this year with a record of 434.35 for a start.

There are men who say that good records in this Herd Test can be put up only by "forced" feeding, and at the same time contend that forced feeding ruins animals. They cannot have it both ways. Garenne 2nd was either forced or she was not. If forcing is essential to high yields, why did this cow not collapse before six strenuous years of testing? If she were not forced, how did she do so well? The fact is she was not forced, as her lasting proves, and further it was not necessary, as her record proves. She was heavily fed no doubt, but she has stood it, and bred on it, and altogether this proves her the very class of cow this test is in search of.

Under type and utility conditions in last Melbourne Show, Garenne 2nd won, thus getting the recognition which was her due. At the same show, when consideration of utility was not prescribed, she was dismissed early from the ring, not getting even a place; *verbum. sap.*, &c.

In the next place, fourth, comes Mr. Syme's strikingly high-testing Friesian, Bolobek Aagie, a cow which combines the Colantha and Hengerveld bloods which are so much responsible for the eminent position the Friesian breed holds in America, its second homeland. Starting in the test as a heifer four years ago, Aagie has three consecutive fine records of 417.43, 512.56, and 538.53 lb. of butter fat, with average tests of 4.35, 4.05, and 4.22 respectively.

Presuming that test and milk yield are separate and distinct Mendelian characters, this test, relative to the usual Friesian cow, would appear to be a recessive, and suggests possibilities of using the cow in conjunction with the apparently dominant Dominion Segis Fobes type as the foundation of interesting experiments in breeding for test.

What must be a particularly encouraging result to Mr. Maloney, as a comparative beginner, is that of his cow, Czarina of Springhurst. Her record of 536.84 lb. puts her into fifth place this year. She is one of the right sort, and her record this year is her crowning performance out of six creditable years of testing in which she has never missed a calving. Her fat yield last year was 404.60 lb. Infanta (5396) 350 lb. fat, and Princess Defiance (4392), which yielded 415.17 lb., are full sisters. They are all by Young Defiance, a successful herd sire of Mr. J. D. Read's, from which they get Defender (imp.) blood, which so often receives a favorable advertisement when his descendants come to be tested. Their dam is Princess of Springhurst, one of Mr. Read's outstanding cows in the earlier days of herd testing, which, through her sire Graceful Lad of Melrose goes back to Royal Blue, a bull which has attracted attention by the success of his daughters in the herd of his owner, Mr. Woodmason. Princess, like her daughter Czarina, tested for six seasons, her records running between 355.28 and 414.27 lb. of fat—a fine example of durability under test.

Mr. Deverell's Brighton Cub cow, Brighton Princess of Springhurst, eleventh on the list with 508.73 lb. fat, is a daughter of Princess Defiance, as is also Banksia of Springhurst (406 lb. fat on second calf) and Dauphine of Springhurst (365 lb. fat).

The sixth place, 528.72 lb. butter fat, is occupied by Mr. A. W. Jones' eleven-year-old Jersey Jubilee 15th, a Navigator cow which we have become accustomed to see among the top-notchers.

Mr. Woodmason's Jenny Lind 10th, of famous family, is again amongst the 500 lb.-and-over band, with a record of 522.52 lb. This is another proof of blood "telling." On the side of her sire, "First Choice of Melrose" (847), she is a grand-daughter of "Pretty Noble" and Carrie 5th of Melrose. The same sire begot Beauty of Tarnpirr

The Geelong Harbour Trust's Heifer, "Boronia of Sparrovale."

(Born 24.8.19.)

Season.	Milk. lbs.	Test.	Butter Fat. lbs.
1921–22	8,824	4·53	399·76

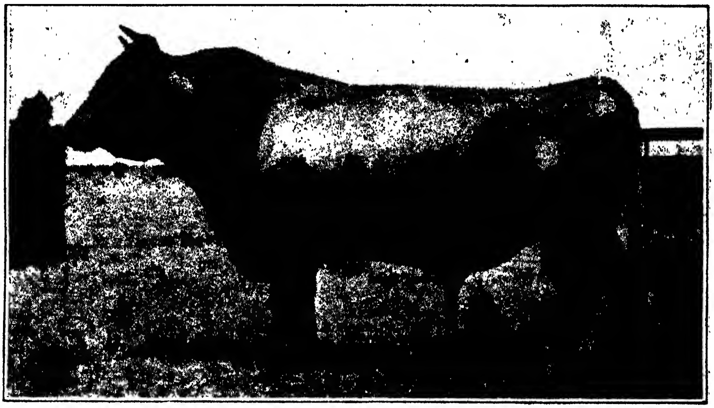
(486 lb. fat), Lady Choice of Tarnpirr (493 lb. fat as a heifer and 474 lb. on second calf), Mistletoe 2nd of Tarnpirr (449 lb. fat when she was top heifer, and 431 lb. on second calf), Veronica of Tarnpirr (406 lb. as a heifer) and numerous other heifers which figured so prominently in the success of the Tarnpirr herd in 1919. First Choice of Melrose is a full brother of Carrie 5th's Noble (1068), the sire of this year's record-breaking heifer, Agnes of Warenda. These two full-blooded sons of Pretty Noble and Carrie 5th of Melrose, both died comparatively young—a great pity—as neither of them ever begot a bad one.

A young cow which has fulfilled her early promise is Messrs. Lyon and Kerr's Jersey, Molly of Clover Flat (by Mabel's Chief, imp.), whose record this year of 522.36 lb. puts her in eighth place. This is

a third lactation yield and follows on a preceding one of 499.07, and another of 403.81 as a heifer. The producing function is here combined with show-ring excellence of high degree.

Another animal which appeals by her beauty of type as well as real utility is the ninth-place cow, Golden Noble Duchess—one of Mr. C. D. Lloyd's imported Jerseys. Her yield this year on her sixth calf is 521.39 lb. butter fat, and she has also two previous yields of 419.22 lb. on her fourth and 415.62 on her fifth calf to her credit.

Captor's Thora, a good Jersey cow which Mr. J. Scott has recently parted with to Mr. H. Luxton at a high figure, is among this year's select, in tenth place, with a record of 520.42 lb. after two earlier records of over 400 lb. each. She is out of Thora (1424) by Captor



A Successful Sire.

Mr. W. K. Atkinson's "Havelock of Darbalara."

(372), whose dam was Capture (300) (imp.). Thora 7th (311.47 lb. fat in the heifer class this year) is a daughter.

A particularly convincing testimony to the theory of functional inheritance is the record of Mr. Mesley's cow, Gazelle 2nd, whose record of 513.67 puts her into eleventh place. She is another of Skim of Dunalister's "get," and is out of Gazelle (5243), whose numerous good records rise to one of 488.59 lb. Gazelle's dam, Namesake 2nd, now twelve years old, has just completed a record of 379.95 lb. fat. A full sister of Gazelle 2nd, viz., La Charme, has numerous good records running up to one of 480.52 lb.

The twelfth place is occupied by the top-yielder of last year, Werribee Starbright 9th, another of Mr. C. D. Lloyd's cows, which has exceeded the 500 lb. mark by eleven pounds. Her record last year, on her second calf, was 582.07 lb. This young animal is by Island's Butter King (imp.) out of Starbright 7th (2863), untested, and is a member of the numerous family of cows bearing that well-known name.

In the post-heifer class Agnes of Warenda leads, as she does also in the heifer class (both lactations ended within the year being dealt with). Her heifer record of 527.20 lb. exceeds that of the best previously leading heifer, Lady Choice of Tarnpirr, by just over 33 lb., and thus constitutes a new record for heifers in this test. She followed up this fine performance by re-calving within the twelve months, having a most severe attack of milk fever at last year's Royal Show, and completing another yield of 497.72 lb. on her second calf.

The 200-lb. Class.

Second in the post-heifer class this year, after being top heifer last year, is another Mesley cow, Ragtime of Warenda, with 482.14 lb., following her 427.24 lb. as a heifer.

The third position in this class is occupied by Valda's Queen of Somerville (464.41 lb.), bred by Mr. J. Hutchinson, and now the property of Messrs. Finn Brothers, two young breeders who have recently removed their stud to Bundoora.

Cherry 12th of Melrose, now owned by Mr. Hunter, has won fourth place with a yield of 455.98 lb. following 361.95 lb. as a heifer. She is by Handsome Boy 5th of Melrose, and thus a grand-daughter of Pretty Noble, Messrs. Dickinson Brothers' young Friesian.

Queenie of Ashby is fifth, yielding 440.29 lb. She is by Pearl's Prince of Brundee, a bull which sired other high producers in this herd.

Then comes a fine young Ayrshire, Viola of Sparrovale, belonging to the Geelong Harbor Trust (434.34 lb. fat). Viola put up 351.55 lb. last year, which then gained her ninth place in the heifer class.

A young Jersey cow which is continuing to do well is Silvermine 18th of Banyule. On her second calf she has put up 431.85 lb. after 357.89 lb. as a heifer. Vixen of Tarnpirr, owned by Mr. Hunter, has a yield of 431.27 lb., and is followed by Mr. T. Harvey's Bluebell 2nd of Jerseyholm, a young cow out of a good producer, and by Mr. Harvey's stud bull Emperor, a bull whose sire and dam were both by Pretty Noble, the dam being Empire 5th of that high-producing Melrose family.

The tenth cow in the post-heifer class is W. Kerr's young Friesian Bolobek Bella, which in a curtailed lactation of 269 days produced 418.91 lb. fat.

The 175-lb. Class.

Of the first ten heifers, four belong to Mr. Mesley, and the producing quality of their blood is referred to elsewhere. The heifer in fourth place is Mr. Harvey's Empress of Jerseyholm (400.43 lb.), also by Emperor (964) and out of Empress 2nd (4979), a Holmwood cow of great producing character (449.70 lb. this year and 491.21 lb. last year) by Audrey's Lord Twylish. The fifth place heifer, Boronia of Sparrovale, is an Ayrshire by Jamie of Sparrovale out of Flower of Sparrovale (3893), one of the best producing cows in this now well-improved herd.

In Red Polls, also, the producing capacity is a matter of the right blood. Cutty Sark, the heifer in sixth position, is by Belligerent (imp.) out of Cutty, a recognised producer in the Department's herd. Cutty's records are worth repeating, viz., 286.77 lb. (as heifer), 388.18 (second calf), 453.73, 442.72, 441.28 and 450.34 lb. It is pleasing to see a new man like Mr. Broad with a heifer in as high a place as seventh in his first year of trying. This heifer, Princess 2nd of Grangelea, has yielded 371.53 lb. fat. The next two (ninth and tenth) are the property of Messrs. Lyon and Kerr, viz., Molly 6th of Banyale (362.49 lb.) and Chorus Girl of Banyale (361.28 lb.), both Audrey's Lord Twylish heifers. The Molly family need no bush, as their records are as well known as the Herd Test itself. Chorus Girl is ex Chorus (2823), a cow which, on her sire's side, goes back to Noble of Oaklands (the sire of Pretty Noble), and on her mother's to Music, the old-time cow from which so many of Mr. Mesley's fine producers are descended. Blood connexions between high producing animals in all three classes could be pointed out almost indefinitely, but sufficient has been shown to bear out the general faith in the character's hereditary transmissibility. New herds which have been entered during the year number 31, and are as follow:—

Jersey.

Anderson, J. jr., Lyndhurst.
Atherton, W. H., Murraydale.
Batson, A. E., Buckley.
Broad, A. A., Sutton Grange.
Chirnside, P., Oakleigh.
Denis, E. A., Swanpool.
Findlay, A. W., Leitchville.
Findlay, J. R., Leitchville.
Griffiths, E. J., Kardella.
Joshua, A., Berwick.
Lawrence, P. H., Agnes.
Moore, E. J., Cowes.
Tendeson, W., Merrigum.

Friesian.

Russell, S., Tongala.
Waite, G. A., Werribee.
Wills, J., Bacchus Marsh.

Ayrshire.

Armstrong, L. F., Woodend.
Cayley, W. C., Werribee.
Clymo, R. C., Bamawm.
Cockbill, W. & J.
Cockbill & Gibbs.
Cullen, W. L., Warrion.
Goodman, R., Kilmany South.
Lees, C., Lockington.
McIvor, W., Moranding.
Munro, H. J., Casterton.
Newton C. G., Kilmany South.
Telford, J. R., Kyabram.

Shorthorn.

Morton, R. G., Bacchus Marsh.

Red Poll.

Dent, R. G., Moe.
Henderson, Dr., Wangaratta.

Owing to increasing costs it has been found necessary to raise the fees for herd testing.

The entry fees now are (*a*) for the herd, £2; (*b*) per cow, 10s.

Herd fee to be paid on entry of herd and renewed annually.

The fee per cow becomes due at beginning of every lactation.

An exception has been made for returned soldiers. Provided a returned soldier is *bonâ fide* owner he is entitled to the former fees, viz., £1 per herd and 5s. per cow for the first five years of testing.

STANDARD COW PRIZES, 1921-22.

The following prizes are offered by the Government for the year ended 30th June, 1922. The prizes will be awarded through the Royal Agricultural Society:—

1. *Grand Champion Cow*—under Herd Test Regulations.

    A grand champion prize of £100, as a trophy or cash, for maintaining the position of annual champion for three years, not necessarily in succession. (Not yet been won.)

2. *Annual Champion Cow*—under Herd Test Regulations.

    A prize of £10 to be awarded to the cow which, during a lactation period terminating within a year ending on 30th June, gives the greatest amount of butter fat under the Herd Testing Regulations of this Department.

    Won by **Rarity 8th of Melrose.** Owner, J. H. Hunter.

3. *Reserve Annual Champion*—under Herd Test Regulations.

    A prize of £5 to be awarded to the cow attaining second place, under the Herd Testing Regulations of this Department, during the year ended 30th June.

    Won by **Dominion Segis Fobes.** Owner, G. A. Waite.

    These prizes to be awarded conditionally upon the winning cow being exhibited at the next Royal Agricultural Show. In the event of the death of the winning cow prior to such Show, the owner is to exhibit his next best cow.

4. *Best Herd*—under Herd Testing Regulations.

    A prize of £20 and a second prize of £10 to be awarded to the herds giving the greatest average returns under the Herd Testing Regulations of this Department, and complying with the following conditions:—

    (1) A minimum of ten cows to complete the test during the year.
    (2) Such herd to average not less than 300 lb. of butter fat. Handicaps to be allowed on the following scale: —
        (*a*) A herd of more than 10 cows to receive a handicap per cow of an amount of butter fat equal to ½ lb. for each cow in the herd.
        (*b*) Cows entered under Regulation 11a to receive a handicap of 75 lb. of butter fat.
        (*c*) Cows entered under Regulation 11b to receive a handicap of 50 lb. of butter fat.

    The prizes to be allotted for the year ended 30th June, and the best three cows in the winning herd to be exhibited at the next Royal Agricultural Show.

    First prize won by the "Warenda" Jersey Herd; owner, **Mr. T. Mesley.**

    Second prize won by the "Meadowvale" Jersey Herd; owner, **Mr. J. H. Hunter.**

No cow may compete for any prize unless she re-calves within fifteen months from her previous calving date.

HERD AVERAGES.

Detailed Returns of the two Prize-winning Herds.

1st — Mr. T. MESLEY'S "Warenda" Jersey Herd.

Cows of the Herd in their Respective Classes.		Butter Fat.	Average Fat per Cow.
		lbs.	lbs.
8 Mature Cows yielded	.. ..	3,732·19	466·52
3 Second-calf Cows yielded	1,364·46 lbs.	..	454·82
Handicap of 50 lbs. each	150·00 „		
		1,514·46	
5 Heifers yielded	2,045·40 lbs.	..	409·08
Handicap of 75 lbs. each	375·00 „		
		2,420·40	
Return (without herd allowance)		7,667·05	
16 Cows in herd allowed 8 lbs. each (the ½ lb. allowance per cow) ..		128·00	
Herd total (including all handicap allowances)		7,795·05	487·19

2nd — Mr. J. H. HUNTER'S "Meadow Vale" Jersey Herd.

Cows of the Herd in their Respective Classes.		Butter Fat.	Average Fat per Cow.
		lbs.	lbs.
5 Mature Cows yielded	.. ..	2,288·86	457·77
4 Second-calf Cows yielded	1,647·01 lbs.	..	411·75
Handicap of 50 lbs. each	200·00 „		
		1,847·01	
1 Heifer yielded	271·77 lbs.	..	271·77
Handicap of 75 lbs. each	75·00 „		
		346·77	
Herd total (including all handicap allowances)		4,482·64	448·26

Averages of the First Twenty-four Herds (over 300 lbs. Average).

Order of Merit.	Owner.	Breed.	Average Yield without any Allowance.						Herd Yield with all handicap allowances.
			Helfers.		2nd Calf.		Mature Cows.		
			No. in Class.	Average Butter Fat.	No. in Class.	Average Butter Fat.	No. in Class.	Average Butter Fat.	
				lbs.		lbs.		lbs.	lbs. fat.
1	T. Mesley	Jersey ..	5	409·08	3	454·82	8	466·52	487·19
2	J. H. Hunter ..	„ ..	1	271·77	4	411·75	5	457·77	448·26
3	T. Harvey	„ ..	2	333·90	3	394·60	8	399·46	417·83
4	W. Woodmason ..	„ ..	6	271·62	5	366·11	25	400·28	411·54
5	Finn Brothers ..	„ ..	1	162·16	1	464·41	9	401·03	401·96
6	Lyon & Kerr	„ ..	15	300·06	5	374·58	14	377·91	400·52
7	A. W. Jones	„ ..	3	309·25	4	249·38	8	427·02	391·93
8	O. J. Syme	Friesian ..	6	274·93	8	319·81	14	392·09	387·68
9	J. D. Read	Jersey ..	14	256·13	6	364·92	10	404·08	387·21
10	W. K. Atkinson ..	Shorthorn ..	2	323·22	3	340·30	9	340·11	366·17
11	A. W. Jones	Friesian ..	15	239·13	6	371·08	8	352·38	361·81

AVERAGES OF THE FIRST TWENTY-FOUR HERDS—*continued.*

Order of Merit.	Owner.	Breed.	Average Yield without any Allowance.						Herd Yield with all handicap allowances.
			Heifers.		2nd Calf.		Mature Cows.		
			No. in Class.	Average Butter Fat.	No. in Class.	Average Butter Fat.	No. in Class.	Average Butter Fat.	
				lbs.		lbs.		lbs.	lbs. fat
12	Department of Agriculture	Red Poll ..	12	251·22	6	239·30	15	355·93	349·51
13	Geelong Harbor Trust ..	Ayrshire ..	5	288·16	6	316·69	11	310·06	348·57
14	H. S. Gibson	" ..	5	252·28	2	340·51	3	327·40	339·96
15	Flack & Sewell ..	Friesian ..	9	247·21	6	306·44	12	289·01	328·57
16	R. Ralston	Ayrshire ..	8	236·33	2	235·23	5	315·60	324·78
17	C. Bamford	" ..	6	237·96	3	253·17	8	321·56	323·78
18	Sadler Brothers ..	" ..	9	244·34	5	242·91	20	303·98	323·42
19	J. H. Rogers.. ..	" ..	4	218·67	2	258·41	10	320·45	320·25
20	L. McFarlane.. ..	" ..	4	248·40	7	243·24	7	306·71	314·18
21	W. J. Colman ..	Jersey ..	..	..	2	371·11	9	279·79	310·98
22	Mrs. Black	" ..	2	203·49	3	254·09	7	313·59	305·37
23	Kerr Brothers ..	Shorthorn ..	4	202·57	3	224·72	14	315·51	302·54
24	Callery Brothers ..	Ayrshire ..	4	227·83	5	284·03	6	253·34	300·93

COWS IN ORDER OF MERIT.

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard.

Order of Merit.	Name	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
1	Rarity 8th of Melrose ..	J. Hunter ..	Jersey ..	11,613	5·57	647·11	Lady of Melrose 2nd's Noble
2	Dominion Segis Fobes ..	G. A. Waite ..	Friesian	18,895	3·26	615·81	Woodcrest Joe
3	Garenne 2nd	T. Mesley ..	Jersey ..	10,416	5·58	581·34	Skim of Dunalister
4	Bolobek Aagie Colantha	O. J. Syme ..	Friesian	12,774	4·22	538·53	Colantha Ponteac
5	Czarina of Springhurst	P. J. Maloney ..	Jersey ..	9,637	5·47	536·84	Young Defiance
6	Jubilee 15th	A. W. Jones ..	" ..	10,235	5·17	528·72	Navigator
7	Jenny Lind 10th of Melrose	W. Woodmason ..	Jersey ..	10,105	5·17	522·52	First Choice of Melrose
8	Molly of Clover Flat ..	Lyon & Kerr ..	" ..	8,943	5·84	522·36	Mabel's Chief
9	Golden Noble Duchess	C. D. Lloyd ..	" ..	8,445	6·17	521·39	Golden Fern's Noble
10	Captor's Thora ..	J. Scott	" ..	8,583	6·06	520·42	Captor
11	Gazelle 2nd of Warenda	T. Mesley ..	" ..	9,601	5·35	513·67	Skim of Dunalister
12	Werribee Starbright 9th	C. D. Lloyd ..	" ..	9,243	5·53	511·44	Island Butter King
13	Brighton Princess of Springhurst	C. Deverall ..	" ..	9,208	5·52	508·73	Brighton Cub
14	Pauline of Ashby ..	Dickinson Bros. ..	Friesian	15,255	3·33	508·25	Pearls Prince of Brundee
15	Coringa	Department of Agriculture	Friesian	13,923	3·58	498·90	Woodcrest Joe
16	Pearl of Riverside ..	J. H. Rogers ..	Ayrshire	10,794	4·56	492·35	Glen Elgin's Elite
17	First Choice of Hillcrest	Leongatha High School	Jersey ..	8,816	5·57	490·98	Black Prince
18	Beauty of Tarnpirr ..	A. W. Jones ..	.. ..	7,647	6·36	486·27	First Choice of Melrose
19	Thana of Somerville ..	Finn Bros. ..	.. ..	8,762	5·54	485·70	Annette's 2nd Twylish of Kingsvale
20	Ringtail of Tarnpirr ..	J. Hunter ..	.. ..	8,973	5·39	483·37	Sport
21	La Charme	T. Mesley ..	" ..	8,823	5·45	480·52	Skim of Dunalister

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
22	Trixie of Tarnpirr	Finn Bros.	Jersey	7,771	6·17	479·62	Morocco's Carnation Fox
23	Queen of Friesland Park	O. J. Syme	Friesian	15,297	3·12	476·80	Colantha Sir Winana
24	Wattle of Sprinhgurst	P. J. Maloney	Jersey	9,619	4·95	476·33	Brighton Cub
25	Beauty 4th of Somerville	J. Hutchinson	„	10,018	4·74	47[illegible]·85	Annette's 2nd Twylish of Kingsvale
26	Rarity 10th of Melrose	W. Woodmason	„	7,279	6·51	473·80	Handsome Boy 5th of Melrose
27	Freezia of Springhurst	J. D. Read	„	8,578	5·47	469·62	Young Defiance
28	Pibroch	T. Mesley	„	8,988	5·22	469·07	Skim of Dunalister
29	Graceful Duchess 14th of Melrose	W. Woodmason	„	7,154	6·47	462·71	Handsome Boy 5th of Melrose
30	Our Choice of Tarnpirr	P. J. Maloney	„	7,259	6·37	462·31	First Choice of Melrose
31	Princess Royal of Springhurst	Finn Bros.	„	8,592	5·35	460·70	Young Defiance
32	Graceful Duchess 11th (C) of Melrose	W. Woodmason	„	7,454	6·16	459·54	Mystery's Son of Melrose
33	Cloudy of Somerville	H. Luxton	„	8,290	5·54	458·99	Annette's 2nd Twylish of Kingsvale
34	Birdseye	Department of Agriculture	Red Poll	9,028	5·08	458·62	Tabacum
35	Mermaid 4th of Melrose	A. W. Jones	Jersey	7,563	6·05	457·91	Handsome Boy 5th of Melrose
36	Trefoil of Springhurst	J. D. Read	„	8,062	5·66	456·48	Young Defiance
37	Charmain	T. Mesley	„	9,537	4·78	455·72	Silver Fox
38	Mona of Hillcrest	Leongatha High School	„	10,610	4·31	455·42	Black Prince
39	Nightshade of Springhurst	J. D. Reid	„	9,087	5·00	454·51	Young Defiance
40	Daisy of Bundara	J. H. Rogers	Ayrshire	10,612	4·28	454·09	Brown Prince of Bundara
41	Nictitana	Department of Agriculture	Red Poll	9,639	4·70	452·63	Nicotine
42	Violation	Department of Agriculture	„	11,068	4·07	450·36	Belligerent
43	Cutty	Department of Agriculture	„	10,599	4·25	450·34	Nicotine
44	Empress 2nd of Holmwood	T. Harvey	Jersey	8,067	5·57	449·70	Audrey's Lord Twylish
45	Hyacinth	Department of Agriculture	Friesian	11,287	3·97	447·82	Oak de Kol's 2nd Homestead Fobes
46	Lady Elector 3rd of Melrosé	W. Woodmason	Jersey	7,570	5·89	446·13	Pretty Noble
47	Morven Pearl 8th	Kerr Bros.	Shorthorn	11,797	3·78	445·75	Manor York Rose 1st
48	Duchess of Friesland Park	O. J. Syme	Friesian	12,302	3·62	445·52	King of Domino's
49	Morven Queenie 8th	Kerr Bros.	Shorthorn	11,581	3·82	442·12	Manor York Rose 1st
50	Quality 6th of Melrose	W. Woodmason	Jersey	9,415	4·70	441·61	Royal Bluo
51	Fuchsia 13th of Melrose	A. W. Jones	„	7,672	5·72	439·13	Lady of Melrose 2nd's Noble
52	Princess Royal	A. W. Jones	Friesian	12,512	3·47	435·19	Pearls Prince of Brundee
53	Crocus of Springhurst	J. D. Read	Jersey	8,225	5·28	434·55	Young Defiance
54	Hawthorn 7th of Banyule	Lyon & Kerr	„	7,996	5·43	434·29	Mabel's Chief
55	Little Queen	T. Mesley	„	8,492	5·08	432·02	Foxy Boy
56	Rose of Sparrovale	Geelong Harbor Trust	Ayrshire	9,508	4·53	430·90	Scottish King of Gowrie Park
57	Lady Marge of Jerseyholm	T. Harvey	Jersey	7,263	5·93	430·42	Sweet Fox 2nd
58	Daphne 4th	D. C. Miller	„	7,292	5·90	429·04	Lotina's Noble of Oaklands
59	Mates 6th of Melrose	J. Hunter	„	9,591	4·44	425·52	Sunshine of Melrose
60	Lilac of Tarnpirr	A. W. Jones	„	7,750	5·47	423·82	Ilford
61	Vanilla 11th of Melrose	W. Woodmason	„	7,207	5·88	423·60	Handsome Boy 5th of Melrose
62	Phyllis of Luscombe	T. Mesley	„	9,244	4·56	421·60	Skim of Dunalister
63	Flower 6th of Melrose	W. Woodmason	„	8,122	5·17	420·08	Royal Blue
64	Bolobek Jean	O. J. Syme	Friesian	11,621	3·61	419·23	Indulge Johanna Lad
65	Holland Lass 2nd of Berry	Flack & Sewell	„	11,516	3·64	418·97	Sultan La Polka
66	Silvermine 16th of Banyule	Finn Bros.	Jersey	7,241	5·64	418·40	Mabel's Chief
67	Kyora Pansy 7th	F. Bidgood	„	8,676	4·81	417·63	Young Defiance 2nd
68	Defender's Favourite of Boorene	A. A. Broad	„	7,648	5·46	417·56	Fox's Nonpariel
69	Morocco	Department of Agriculture	Red Poll	11,920	3·50	417·43	Ganymede
70	Jenny Lind 9th of Melrose	W. Woodmason	Jersey	6,986	5·97	417·27	Pretty Noble
71	Phyllis of Ashby	Dickinson Bros.	Friesian	11,778	3·38	417·11	Pearls Prince of Brundee
72	Jonquil of Springhurst	J. D. Read	Jersey	6,949	5·99	416·25	Attraction of Springhurst
73	Dairymaid of Ben Keil	R. Ralston	Aryshire	9,403	4·43	416·13	Melville Duke
74	Netherland Jessie Inka	J. T. Tweddle	Friesian	11,584	3·58	415·70	Netherland Prince
75	Domino Hergenveld Belle	O. J. Syme	„	11,448	3·63	415·09	King of Domino's

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
76	Graceful Duchess 11th of Melrose No. 2	W. Woodmason ..	Jersey ..	6,728	6·17	415·07	Pretty Noble
77	Miss Muller 2nd of Berry	Flack & Sewell ..	Friesian	11,439	3·63	415·03	Sultan La Polka
78	Camellia of Springhurst	Mrs. I. Beard ..	Jersey ..	6,893	6·09	411·84	Investigator of Melrose
79	Kirsty 6th of Jerseyholm	T. Harvey ..	" ..	6,580	6·14	413·71	Venture's Hero
80	Chevy 8th of Melrose ..	W. Woodmason ..	" ..	7.075	5·84	413·70	Pretty Noble
81	Sparkle 2nd of Jerseyholm	T. Harvey ..	" ..	6,550	6·13	413·60	Venture's Hero
82	Bolobek Dolly Grey ..	O. J. Syme ..	Friesian	11,041	3·74	413·28	Rhoda Prince of Rubicon
83	Gentle of Evergreen ..	H. S. Gibson ..	Ayrshire	10,065	4·09	411·64	Duke of Wethersdane
84	Werribee Northwood Madeira 6th	C. D. Lloyd ..	Jersey ..	6,753	6·09	411·57	Northwood King
85	Hawthorn 6th of Banyule	Lyon and Kerr ..	" ..	8,018	5·13	411·35	Mabel's Chief
86	Blossom 4th of Melrose	W. Woodmason ..	" ..	7,611	5·40	411·13	Pretty Noble
87	Kirsty 7th of Jerseyholm	T. Harvey ..	" ..	6,416	6·40	410·63	Venture's Hero
88	Pidgeon of Kameruka	Mrs. Alston Estate	" ..	7,028	5·83	409·46	Silver King
89	Laura 9th of Melrose ..	W. Woodmason ..	" ..	6,582	6·22	409·27	Pretty Noble
90	Lady Grey 8th of St. Albans	A. W. Jones ..	" ..	8,710	4·70	409·13	Navigator
91	Tonga	Department of Agriculture	Red Poll	10,066	4·06	408·44	Honingham Archbishop
92	Soprano 2nd of Banyule	Lyon & Kerr ..	Jersey ..	7,320	5·58	408·17	Mabel's Chief
93	Silvermine 15th of Banyule	Finn Bros. ..	" ..	8,754	4·64	406·30	Mabel's Chief
94	Blanche Rose 10th ..	W. K. Atkinson ..	Shorthorn	10,323	3·66	404·69	Popular Vale Prince 9th
95	Dot of Golden Vein ..	W. J. McKernan ..	Ayrshire	8,325	4·85	404·17	Earnie of Willowvale
96	Dominion Lulu 2nd ..	Department of Agriculture	Friesian	12,847	3·15	404·05	Woodcrest Joe
97	Molly 4th of Banyule ..	Lyon and Kerr ..	Jersey	8,176	4·94	403·62	Starbright's Lord Twylish
98	Milkmaid 37th ..	Lyon and Kerr ..	" ..	7,771	5·17	401·86	Brighton Prince
99	Balsam of Springhurst	P. J. Maloney ..	" ..	7,622	5·25	400·11	Young Defiance
100	Belle Corona	Department of Agriculture	Friesian	11,450	3·49	399·98	Oak de Kol Homestead Fobes
101	Belladonna of Springhurst	J. D. Read ..	Jersey ..	8,148	4·90	399·08	Attraction of Springhurst
102	Golden Fern of Glen Iris	C. D. Lloyd ..	" ..	6,343	6·20	398·89	Mabel's Chief
103	Jessie 20th of Melrose ..	W. Woodmason ..	" ..	6,351	6·25	397·02	Handsome Boy 5th of Melrose
104	Fuchsia 12th of Melrose	C. J. Reid ..	" ..	8,046	4·93	396·64	Pearl's Son of Melrose
105	Maitland's Floss ..	A. W. Findlay ..	" ..	7,894	4·99	394·28	Magnet's Maitland
106	Vanity of Warrock ..	Cockbill and Gibbs	Ayrshire	8,508	4·63	393·86	Alice's Jamie of Oakbank
107	Banksia of Springhurst	Mrs. I. Beard ..	Jersey	6,421	6·13	393·38	Bulwark
108	Flower of Hyde Park ..	J. R. Telford ..	Ayrshire	8,653	4.54	392·94	Ventry of Seafield
109	My Hope of Kameruka	Mrs. E. Sims ..	Jersey	6,732	5·83	392·48	Twylish's Pride
110	Waverly Lass 3rd of Melrose	W. Woodmason ..	" ..	6,082	6·45	392·21	Handsome Boy 5th of Melrose
111	Briar	Department of Agriculture	Red Poll	9,053	4·32	391·28	Nicotine
112	May Queen 2nd ..	A. W. Jones ..	Friesian	9,994	3·91	390·70	Annette's Prince
113	Roan Daisy 18th ..	W. K. Atkinson ..	Shorthorn	9,085	4·27	387·99	Popular Vale Prince 9th
114	Noorat Marguerite ..	Mrs. A. Black ..	Jersey ..	8,328	4·66	387·95	Obelisk
115	Jubilee Azalia Winks ..	Miss B. Reid ..	" ..	6,852	5·65	387·34	Goddington Winks 6th
116	Escape of Murndale ..	Finn Bros. ..	" ..	7,609	5·09	387·21	Canary's Lad 13th
117	Tiny of Tarnpirr ..	J. Hunter ..	" ..	6,661	5·81	387·13	Morocco's Carnation Fox
118	Blanche Rose 9th ..	W. K. Atkinson ..	Shorthorn	10,323	3·74	387·08	Poplar Vale Prince 9th
119	Lady Grey 1st of St. Albans	A. W. Jones ..	Jersey ..	6,147	6·26	384·72	Garanties Antimony
120	Harp	Lyon and Kerr ..	" ..	7,382	5·21	384·56	Noble Lord
121	Alice	Leongatha High School	" ..	6,286	6·11	383·95	Empire 4th's Son of Melrose
122	Gingerbread	C. D. Lloyd ..	" ..	6,922	5·55	383·83	Mabel's Chief
123	Rosella 2nd of Kingsvale	R. H. Maher ..	" ..	7,429	5·16	383·39	Canary's Lad 8th
124	Anithra of Gowrie Park	D. F. Griffiths ..	Ayrshire	8,747	4·38	383·00	Heather Jock 2nd
125	Aspasia of Banyule ..	G. Vallance ..	" ..	8,975	4·25	381·53	Highcourt of Banyule
126	Edith 6th of Melrose ..	W. Woodmason ..	Jersey ..	6,278	6·08	381·39	Handsome Boy 5th of Melrose
127	Audrey of Somerville ..	H. Luxton ..	" ..	7,670	4·96	380·51	Annette's 2nd Twylish of Kingsvale
128	Bluebell of Warrock ..	H. J. Munro ..	Ayrshire	9,639	3·94	380·19	Alice's Jamie of Oakbank
129	Fox's Clementine 2nd ..	F. Bidgood ..	Jersey ..	6,999	5·43	379·91	Carnation's Fox
130	Bolobek Amabel ..	O. J. Syme ..	Friesian	9,397	4·04	379·55	Indulge Johanna Lad
131	Oatlands Polly ..	J. Thorburn ..	Ayrshire	8,326	4·55	378·97	Captain Tasman
132	Scotia	Mrs. M. E. Carroll	Red Poll	9,996	3·79	378·92	Nicotine
133	Bolobek Rhoda ..	O. J. Syme ..	Friesian	10,517	3·61	378·72	Rhoda's Prince of Rubicon
134	Philomel	T. Mesley ..	Jersey ..	7,501	5·04	378·25	Falcon
135	Bolobek Rose.. ..	A. W. Jones ..	Friesian	10,132	3·73	378·05	Colantha Ponteac
136	Lucy of Kingsvale ..	J. Anderson, Jnr. ..	Jersey ..	6,437	5·86	376·96	Lucy's Noble of Oaklands

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
137	Silvermine 14th of Banyule	Lyon and Kerr ..	Jersey ..	8,661	4·34	375·69	Mabel's Chief
138	Seaweed of Springhurst	Finn Bros. ..	" ..	7,074	5·28	374·61	Investigator of Melrose
139	Dominion Homestead Maggie	Flack and Sewell ..	Friesian	11,442	3·25	373·25	Longbeach Primrose League
140	Daisy 6th of Jerseyholm	T. Harvey ..	Jersey ..	6,709	5·56	372·74	Emperor
141	Mowbray Lass of Kyle 2nd	C. Lees ..	Ayrshire	9,418	3·95	371·55	Mowbray Gordon
142	Princess Ena	O. J. Syme ..	Friesian	10,619	3·50	371·09	Duplicate Posch
143	Mystery's 14th Beauty of Lesterfield	A. W. Findlay ..	Jersey ..	7,360	5·02	369·18	Magnet's Maitland
144	Nanette 2nd of Warenda	Mrs. I. Beard ..	" ..	5,605	6·55	367·29	Skim of Dunalister
145	Jessie 12th of Melrose ..	W. Woodmason ..	" ..	6,336	5·79	366·94	Pretty Noble
146	Morven Duchess 13th ..	Kerr Bros. ..	Shorthorn	9,197	3·98	366·29	Charming Duke 27th
147	Clover of Springhurst ..	J. D. Read ..	Jersey ..	6,605	5·54	366·14	Brighton Cub
148	Dauphine of Springhurst	J. D. Read ..	" ..	5,528	6·60	365·12	Investigator of Melrose
149	Duplicate Posch Maud	O. J. Syme ..	Friesian	10,886	3·35	364·57	Duplicate Posch
150	Babe of Medburn Grove	C. Bamford ..	Ayrshire	9,118	3·99	363·34	Leo of Gleneira
151	Trissie of Wethersdane..	J. R. Telford ..	" ..	8,096	4·49	363·18	His Majesty of Wethersdane
152	Graceful Duchess 17th of Melrose	W. Woodmason ..	Jersey ..	5,428	6·68	362·86	Handsome Boy 5th of Melrose
153	Lady Elector 2nd of of Melrose	W. Woodmason ..	" ..	5,989	6·02	360·80	Pretty Noble
154	Rosebud of Grangelea ..	A. A. Broad ..	" ..	7,756	4·65	360·66	Kalimna's Fox
155	Cora 2nd of Havilah ..	J. Scott	" ..	6,431	5·61	360·61	Silver Belle's Golden Lad
156	Graceful Duchess 18th of Melrose	W. Woodmason ..	" ..	5,540	6·50	360·34	Handsome Boy 5th of Melrose
157	Good News 2nd of Roxburgh	T. Douglas ..	Ayrshire	8,338	4·32	360·27	Jinncy's Pride
158	Pansy of Colac ..	C. Falkenberg ..	Jersey ..	7,714	4·67	360·24	Handsome Progress
159	Meadow Sweet of Sparrovale	Geelong Harbor Trust	Ayrshire	7,416	4·86	360·23	Jock of Sparrovale
160	Morven Pansy 7th ..	Kerr Bros. ..	Shorthorn	8,923	4·04	360·12	Manor York Rose 1st
161	Lady Louie of View Point	Sadler Bros ..	Ayrshire	9,460	3·79	358·84	Jimmie of View Point
162	Princess of Colac ..	C. Falkenberg ..	Jersey ..	6,430	5·58	358·11	Irrewarra Duke
163	Capture	W. J. Colman ..	" ..	8,021	4·45	357·28	Maids Spark
164	Blanche Rose 9th ..	W. K. Atkinson ..	Shorthorn	10,305	3·46	357·07	Poplar Vale Prince 9th
165	Bluebell of Jerseyholm..	T. Harvey ..	Jersey ..	5,925	6·02	356·85	Venture's Hero
166	Daffodil	T. H. Payne ..	Red Poll	7,342	4·86	356·86	Cubata
167	Get 2nd of Kilmarnock	Sadler Bros. ..	Ayrshire	8,673	4·23	356·58	Blooming Boy of Gowrie Park
168	Bolobek Bess	A. W. Jones ..	Friesian	8,814	4·04	356·34	Rhoda's Prince of Rubicon
169	Jessie 15th of Melrose ..	W. Woodmason ..	Jersey ..	5,725	6·21	355·74	Pretty Noble
170	Lucy of Staghorn ..	F. Bidgood ..	" ..	7,096	5·01	355·71	Favourite's Noble of Hyora
171	Starlight of Wethersdane	C. Bamford ..	Ayrshire	9,012	3·94	355·23	Glen Elgin's Combine
172	Nimitabel of Kameruka	J. Trevaskis ..	Jersey ..	6,787	4·62	355·17	Silver King
173	Beryl of Gleneira ..	L. McFarlane ..	Ayrshire	8,905	3·98	355·08	Majestic of Oakbank
174	Norah's Pearl.. ..	A. W. Jones ..	Friesian	9,730	3·64	354·35	Pearl's Prince of Brundee
175	Surprise	Leongatha High School	Jersey ..	6,029	5·87	353·92	Prince's Glory
176	Bolobek Isabella ..	O. J. Syme ..	Friesian	10,721	3·30	353·44	Indulge Johanna Lad
177	Monas Pride of Woorayl	Leongatha High School	Jersey ..	5,890	5·99	352·52	Prince's Glory
178	Graceful Countess of Lesterfield	P. Chirnside ..	" ..	5,851	6·01	351·50	Handsome Boy 3rd of Melrose
179	Brookland Maid ..	A. W. Jones ..	Friesian	8,897	3·94	350·84	Woodcrest Netherland Pletji
180	Lady of Sunnybrook ..	A. E. Haughton ..	Jersey ..	7,104	4·92	350·01	May Boy 3rd of Banyule
181	Morven Duchess 15th ..	Kerr Bros. ..	Shorthorn	9,337	3·75	349·65	Manor York Rose 10th
182	Sweet Violet of Seafield	A. Kirbey ..	Ayrshire	7,931	4·41	349·54	Philosopher of Glengowrie
183	Ettie 5th of Banyule ..	Lyon and Kerr ..	Jersey ..	7,036	4·97	349·43	Mabel's Chief
184	Roseleaf of View Point	J. W. Cochrane ..	Ayrshire	8,353	4·18	349·21	Hector of Mapleton
185	Mode of Fernhill ..	H. D. W. Canobio	" ..	8,507	4·10	349·19	Glen Elgin's Ben
186	Lucerne of Springhurst	J. D. Read ..	Jersey ..	6,767	5·15	348·99	Young Defiance
187	Lesbia of Yalart ..	Sadler Bros. ..	Ayrshire	8,412	4·15	348·86	Tribune of Gleneira
188	Kirsty 5th	T. Harvey ..	Jersey ..	7,024	4·96	348·04	Sweet Fox
189	Dainty Maid of Holmwood	Lyon and Kerr ..	" ..	6,603	5·59	346·79	Audrey's Lord Twylish
190	Epaulette	Department of Agriculture	Red Poll	7,795	4·45	346·76	Belligerent
191	Noorat Grey Girl ..	Mrs. A. Black ..	Jersey ..	6,724	5·15	346·21	Obelisk
192	Peerless 13th of Melrose	J. Hunter ..	" ..	6,956	4·98	345·73	Handsome Boy 5th of Melrose
193	Pearl of Riverside ..	J. H. Rogers ..	Ayrshire	9,057	3·81	345·59	Glen Elgin's Elete
194	Pearl of Hillcrest ..	Mrs. E. M. Lennie	Jersey ..	7,360	4·69	345·05	Noble of Balwyn
195	Pearl 5th of Holmwood	Lyon and Kerr ..	" ..	7,452	4·63	344·93	Audrey's Lord Twylish
196	Roan Daisy 18th ..	W. K. Atkinson ..	Shorthorn	8,749	3·94	344·75	Poplar Vale Prince 9th
197	Molline of La Motte ..	S. A. Johnson ..	" ..	6,940	4·94	343·96	Captain Tasman
198	Maitland's Petal ..	J. Scott	Jersey ..	6,319	5·44	343·44	Navigator

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
199	Cherry 5th	W. K. Atkinson ..	Shorthorn	8,595	3·99	343·13	White Clinker
200	Iris	Department of Agriculture	Red Poll	8,008	4·28	342·67	Nicotine
201	Gladness 2nd of Struan Park	D. F. Griffiths ..	Aryshire	8,475	4·04	342·08	Bonnie King of Gowrie Park
202	Bercham of Berry ..	Flack and Sewell ..	Friesian	9,448	3·61	341·36	Obbee 2nd
203	Daisy 7th of Melrose ..	W. Woodmason ..	Jersey ..	6,417	5·31	341·01	Lady of Melrose 2nd's Noble
204	Phœbe of Ashby ..	Dickinson Bros. ..	Friesian	9,700	3·51	340·80	Pearl's Prince of Brundee
205	Noorat Beauty ..	Mrs. A. Black ..	Jersey ..	7,150	4·76	340·03	Obelisk
206	Royal Sun Ray ..	Mrs. E. Sims ..	" ..	6,828	4·97	339·17	Peerless' Lord Twylish
207	Melba	A. W. Jones ..	Friesian	8,579	3·95	339·00	Pearl's Prince of Brundee
208	Barbara	J. Bemallack ..	Ayrshire	7,520	4·50	338·36	Dunoon of Seafield
209	Bolobek May ..	O. J. Syme ..	Friesian	10,073	3·36	338·24	Indulge Johanna Lad
210	Graceful Duchess 10th of Melrose	W. Woodmason ..	Jersey ..	5,416	6·23	337·67	Jessie's 4th Son of Melrose
211	Fairlie of Burnbrae ..	Sadler Bros. ..	Ayrshire	7,559	4·29	337·51	Brae Loch
212	Sylvian Maid of Glenalvie	L. McFarlane ..	" ..	9,150	3·67	336·13	Stately of Gleneira
213	Nora 3rd of Gleneira ..	J. A. Lang ..	" ..	7,991	4·20	335·26	Jock of Gowan Bank
214	Lady Burnbrae ..	Sadler Bros. ..	" ..	8,211	4·08	335·21	Prince Charlie of Lake View
215	Dominion Proud Lassie	Department of Agriculture	Friesian	10,531	3·17	334·22	Woodcrest Joe
216	Snowflake of Springhurst	W. H. Waycott ..	Jersey ..	6,392	5·23	334·01	Brighton Cub
217	Flower of Sparrovale ..	Geelong Harbor Trust	Ayrshire	7,668	4·34	332·66	Glen Elgin's Rover
218	Ettie of Banyule ..	G. Vallance ..	Ayrshire	7,410	4·49	332·41	The Lad of Banyule
219	Daisy 3rd of Kingsvale	F. W. Beischer ..	Jersey ..	7,150	4·64	331·94	Viola's Lad 2nd of Kingsvale
220	Lantana of Springhurst	J. L. & E. J. Henderson	" ..	5,569	5·96	331·94	Fisher of Springhurst
221	Madge of Medburn Grove	C. Bamford ..	Ayrshire	8,802	3·77	331·76	Leo of Gleneira
222	Morven Queenie 9th ..	W. K. Atkinson ..	Shorthorn	9,092	3·65	331·66	Manor York Rose 1st
223	Creamy of Lesterfield ..	P. Chirnside ..	Jersey ..	7,290	4·54	331·23	Handsome Boy 3rd
224	Begum of Springhurst	J. D. Read ..	" ..	5,778	5·71	330·11	Investigator of Melrose
225	Pearl 5th	W. J. Colman ..	" ..	6,087	5·41	329·43	Lady Melrose 2nd's Noble
226	Buttercup of Bonshaw	P. J. Maloney ..	" ..	5,740	5·74	329·35	Pilot of Tarnpirr
227	The Gift of Hillcrest ..	Leongatha High School	" ..	7,013	4·68	328·01	Duke of Hillcrest
228	Lily of Ferntree Vale ..	H. Luxton ..	" ..	6,181	5·29	327·82	Audrey's Lord Twylish
229	Monas Pearl	Mrs. A. Black ..	" ..	6,920	4·74	327·70	Prince Nita
230	Moonbeam of Medburn Grove	C. Bamford ..	Ayrshire	7,911	4·14	327·28	Leo of Gleneira
231	Daphne 3rd	D. C. Miller ..	Jersey ..	6,850	4·77	326·80	May's Larkspur's Lord Twylish
232	Bud of Banyule ..	G. Vallance ..	Ayrshire	7,973	4·10	326·78	Melville Duke
233	Lenore of Ecclefechan ..	Sadler Bros ..	" ..	8,187	3·99	326·04	Adam of Coolangatta
234	Diana 6th of Braelands	F. G. Sadler ..	Shorthorn	8,222	3·96	325·84	43rd Earl of Pentland
235	Pearl of Ben Nell ..	R. Ralston ..	Ayrshire	7,975	4·08	325·56	Melville Duke
236	Rose Royal of Langley Park	Callery Bros. ..	" ..	7,654	4·25	325·30	Royalty of Rythdale
237	Ada of Wethersdane ..	Sadler Bros. ..	" ..	8,147	3·99	324·96	His Majesty of Wethersdane
238	Gratis	T. H. Payne ..	Red Poll	7,994	4·06	324·76	Acton Ajax
239	Nicety of Yalart ..	Sadler Bros ..	Ayrshire	7,566	4·29	324·30	Magician of Gleneira
240	Tulip 4th of Bonshaw ..	Mrs. E. M. Lennie..	Jersey ..	6,357	5·10	323·96	The Pilot of Tarnpirr
241	Daphne of Ayrbrae ..	L. McFarlane ..	Ayrshire	6,915	4·68	323·95	Earl of Drayton
242	Gipsy Girl of Sparrovale	Geelong Harbor Trust	" ..	6,607	4·90	323·87	Scottish King of Gowrie Park
243	Woodnymph ..	Department of Agriculture	Friesian	10,518	3·07	322·86	Woodcrest Joe
244	Pearl 2nd of Melrose ..	W. Woodmason ..	Jersey ..	5,973	5·40	322·44	Jessie's 4th Son of Melrose
245	Trixie of Colac ..	C. Falkenberg ..	" ..	5,724	5·63	322·30	Handsome Progress
246	Jamaica	Mrs. M. E. Carroll	Red Poll	8,052	4·00	322·02	Ganymede
247	Plumstead Pip (Imp.) ..	T. H. Payne ..	" ..	7,343	4·38	321·96	Plumstead Pearl
248	Princess of Kudala ..	W. J. Colman ..	Jersey ..	6,444	4·98	320·95	Starbright Renard
249	Morea of Seafield ..	J. W. Cochrane ..	Ayrshire	8,595	3·73	320·87	Philosopher of Glengowrie
250	Mona of Vale Hill ..	T. Douglas ..	" ..	7,775	4·13	320·71	Oliver's Jamie
251	Pearl 3rd of Holmwood	Lyon and Kerr ..	Jersey ..	6,292	5·09	320·06	Audrey's Lord Twylish
252	Pastime of Tarnpirr ..	E. A. Denis ..	" ..	5,765	5·55	320·00	Sport
253	Future of Warrook ..	J. Rogers ..	Ayrshire	7,679	4·16	319·78	Alice's Jamie of Oakbank
254	Creamy 2nd of Holmwood	Miss L. Robinson ..	Jersey ..	6,495	4·90	318·53	Pearl's Prince of Holmwood
255	Putunia of Glencairn ..	N. Gange ..	Ayrshire	7,521	4·23	317·93	Peacemaker of Glencairn
256	Madge	Mrs. A. Black ..	Jersey ..	6,632	4·79	317·66	Rufus
257	Laurel of Burnbrae ..	Sadler Bros. ..	Ayrshire	8,197	3·86	316·66	Adam of Coolangatta
258	Daphne of Ayrbrae ..	L. McFarlane ..	Ayrshire	7,319	4·32	315·82	Earl of Drayton
259	Gladsome of Medburn Grove	C. Bamford ..	" ..	8,248	3·83	315·59	Leo of Gleneira
260	Ontario	Department of Agriculture	Red Poll	8,391	3·75	315·39	Acton Dewstone

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
261	Bluebell of Sparrovale..	Geelong Harbor Trust	Ayrshire	8,035	3·92	315·35	Jock o' Gowrie
262	Jean of Glengowrie ..	A. H. Schier ..	" ..	7,939	3·97	315·01	Ada's Jamie of Glengowrie
263	Rosetta 3rd ..	F. Sadler.. ..	Shorthorn	7,582	4·15	314·97	43rd Earl of Pentland
264	Art of Springhurst ..	J. Hutchinson ..	Jersey ..	6,689	4·70	314·25	Brighton Cub
265	Satinbird of Burnbrae ..	Sadler Bros. ..	Ayrshire	7,267	4·32	314·08	Bonnie King of Gowrie Park
266	Lady Grey 5th of St. Albans	T. R. Findlay ..	Jersey ..	6,056	5·18	313·49	Sweet Fox
267	Honeysuckle of Springhurst	C. W. W. Macauley	" ..	6,212	5·04	313·05	Young Defiance
268	Bountiful of La Motte ..	S. A. Johnson ..	Ayrshire	6,895	4·54	312·88	Lochinvar of Prior Park
269	Lady of the Valley ..	T. Douglas ..	" ..	7,302	4·28	312·74	Pride of Yarra
270	Letty 2nd of Warrook ..	Cockbill & Gibbs ..	" ..	7,073	4·41	312·25	Minerva's Jamie of Oakbank
271	Jessie 13th of Melrose ..	W. Woodmason ..	Jersey ..	5,223	5·98	312·13	Pretty Noble
272	Bridesmaid of Clarendon-eyre	Finn Bros. ..	" ..	6,751	4·60	310·68	Lotina's Larkspur's Twylish
273	Maggie of Ashby ..	Dickinson Bros. ..	Friesian	8,439	3·68	310·40	Pearl's Prince of Brundee
274	Primrose 2nd of Bonshaw	Mrs. E. M. Lennie	Jersey ..	5,936	5·23	310·21	The Pilot of Tarnpirr
275	Merella 2nd of Yarra Brae	Mrs. E. M. Lennie	" ..	5,695	5·24	308·59	Starbright Renard
276	Dominion Fayne Segis	Flack & Sewell ..	Friesian	8,971	3·54	307·56	Longbeach Primrose League
277	Lassie 4th of Clover Flat	F. Raggatt ..	Jersey ..	6,486	4·74	307·42	Prince Noreen
278	Flossie 2nd of Raith ..	Leslie & Gerrand ..	Ayrshire	7,873	3·90	306·32	Adela's Jamie of Raith
279	Holly Queen of Pentland 4th	F. Sadler.. ..	Shorthorn	7,597	3·65	305·96	Duke of Woodlands
280	Mountain Mist of Kameruka	Miss B. Reid ..	Jersey ..	6,188	4·94	305·92	Jubilee May's 2nd Prince
281	Stella of Golden Vein ..	W. McIvor ..	Ayrshire	7,729	3·95	305·53	Anither of Oakbank
282	Annette 2nd of Kingsvale	F. W. Beischer ..	Jersey ..	6,411	4·76	304·96	Victim's Defiance
283	Dominion Cora ..	Flack & Sewell ..	Friesian	8,833	3·40	304·51	Oak de Kol
284	Maid of Sparrovale ..	Geelong Harbor Trust	Ayrshire	7,312	4·15	303·20	Glen Elgin's Rover
285	Flirt of Kilmarnock ..	Sadler Bros. ..	" ..	8,701	3·48	303·19	Thyra's Record
286	Jubilee of Somerset ..	A. E. Batson ..	Jersey ..	5,564	5·44	302·73	Discoverer
287	Roan Ada 4th ..	F. Sadler.. ..	Shorthorn	8,292	3·65	302·68	43rd Earl of Pentland
288	Jean of Belle Vue ..	H. S. Gibson ..	Ayrshire	7,211	4·20	302·65	Dorman of Seafield
289	Ladybird of Mapleton ..	J. Rogers ..	" ..	6,996	4·32	302·46	Hero of Rythdale
290	Last Rose of Medburn Grove	C. Bamford ..	" ..	6,696	4·48	302·31	Leo of Gleneira
291	Bramble	Department of Agriculture ..	Red Poll	7,706	3·91	301·64	Belligerent
292	Gwendoline of Gleneira..	C. Rigby ..	Ayrshire	7,913	3·80	300·49	Majestic of Oakbank
293	Dairymaid of Warrook..	W. Henderson ..	" ..	7,162	4·20	300·48	Alice's Jamie of Oakbank
294	Satinbird of Burnbrae ..	Sadler Bros ..	" ..	7,401	4·06	300·30	Bonnie King of Gowrie Park
295	Dominion Grace de Kol	G. A. Waite ..	Friesian	9,560	3·14	300·23	Longbeach Primrose League
296	Verona of Warrook ..	Cockbill & Gibbs ..	Ayrshire	7,297	4·11	299·91	Minerva's Jamie of Warrook
297	Greatness of Roxburgh	T. Douglas ..	" ..	6,960	4·31	299·63	Glen Elgin's Grand Duke
298	Nora 7th of Avondale ..	G. Keys	" ..	6,975	4·29	299·43	Linda's Jamie of Avondale
299	Barbara of Brundee ..	O. J. Syme ..	Friesian	9,334	3·21	299·31	Edinglassie
300	Ibis of Gleneira ..	R. Ralston ..	Ayrshire	6,430	4·65	299·04	White Prince of Gleneira
301	Fashion of Warrook ..	W. C. Greaves ..	" ..	5,859	5·10	298·63	Minerva's Jamie of Warrook
302	Dinah of Mapleton ..	G. A. Kent ..	" ..	6,909	4·31	298·12	Hero of Rythdale
303	Vera of Dunachton ..	R. Hall	" ..	8,182	3·64	297·82	Alpha of Summerhill
304	Olive of Medburn Grove	C. Bamford ..	" ..	7,453	3·99	297·71	Leo of Gleneira
305	Myrtle 2nd of Pine Grove	A. H. Schier ..	" ..	7,119	4·18	297·71	Glen Keith of Pine Grove
306	Lilian of Willowvale ..	W. Meredith ..	" ..	7,180	4·14	297·60	Tarbolton of Oakbank
307	Gertie of Warrook ..	W. Henderson ..	" ..	6,241	4·76	297·30	Fashionable
308	Duchess of Sparrovale ..	Geelong Harbor Trust	" ..	6,930	4·29	297·17	Stuart of Gowrie Park
309	Annie of Taringa ..	C. Falkenberg ..	Jersey ..	5,328	5·57	296·68	Golden Spark
310	Berry of Warrook ..	W. Henderson ..	Ayrshire	6,336	4·68	296·26	Beryl's Conservative
311	Daisy 3rd of Kingsvale	F. W. Beischer ..	Jersey ..	6,749	4·39	296·19	Viola's Lad 2nd of Kingsvale
312	Dolichus of Springhurst	C. Deverall ..	" ..	5,895	5·02	296·07	Brighton Cub
313	Pearl of Friesland Park	O. J. Syme ..	Friesian	8,900	3·32	295·83	King of Dominos
314	Starfinch 2nd ..	Lyon & Kerr ..	Jersey ..	6,108	4·84	295·61	Combination Jack
315	Pearleen of Kilmarnock	Sadler Bros. ..	Ayrshire	7,675	3·85	295·12	Annie's Laird of Kilmarnock
316	Scottish Lass of Glenbrae	Warrnambool High School	" ..	6,540	4·51	295·06	Warlock of Fernhill
317	Cowslip of Devon Park	J. W. Cochrane ..	" ..	6,101	4·83	294·89	Sultan of Devon Park
318	Poley	H. G. Dent ..	" ..	7,434	3·97	294·86	Redman
319	Laura of Warrook ..	W. Henderson ..	" ..	7,256	4·06	294·71	Alice's Jamie of Oakbank
320	Bonnie Jean of Langley Park	Callery Bros. ..	" ..	6,263	4·70	294·18	Bonnie's Chiel of Victoria Bank
321	Defender's Queen of St. Albans	A. E. Batson ..	Jersey ..	5,973	4·90	292·79	Linden's Chief
322	Ryebread of Glen Iris ..	C. D. Lloyd ..	" ..	5,473	5·35	292·59	Mabel's Chief
323	Amy of Golden Vein ..	J. A. Lang ..	Ayrshire	7,076	4·13	292·43	Rufus of Golden Vein
324	Cynthia of Glengowrie	Sadler Bros. ..	" ..	7,952	3·68	292·38	Bruce of Glengowrie
325	Murmur 4th of Gleneira	F. McIver ..	" ..	6,872	4·25	292·14	Kia Ora of Haydown

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
326	Hawthorn 5th of Banyule	Lyon & Kerr ..	Jersey	5,806	5·03	291·99	Mabel's Chief
327	Mauve Lilac	Miss B. Reid ..	„ ..	5,105	5·71	291·57	Ironmuster
328	Morven Cressider ..	Kerr Bros. ..	Shorthorn	7,338	3·97	291·57	Manor York Rose 1st
329	Lotina's Twylish of Roseneath	D. C. Miller ..	Jersey ..	5,759	5·05	290·87	Lotina's Noble of Oaklands
330	Mulberry 2nd of Gleneira	L. McFarlane ..	Ayrshire	7,611	3·82	290·85	Kia Ora of Haydowns
331	Patricia	F. G. Sadler ..	Shorthorn	6,917	4·20	290·47	Hayle Prince of Portland
332	Lady of Ecclefechan ..	Sadler Bros. ..	Ayrshire	7,024	4·14	290·45	Adam of Coolangatta
333	Morven Oxford Summerton	Kerr Bros. ..	Shorthorn	7,289	3·98	290·33	Manor York Rose 1st
334	Cloverleaf	W. J. Coleman ..	Jersey ..	6,068	4·78	290·21	May Boy of Banyule
335	Morven Duchess 14th ..	Kerr Bros. ..	Shorthorn	8,110	3·58	290·00	Charming Duke 27th
336	Blanche of Ben Kell ..	G. Vallance ..	Ayrshire	7,971	3·63	289·59	Melville Duke
337	Streak of Balvormie ..	A. H. Schier ..	„ ..	6,866	4·21	288·96	Warrior
338	Sweetheart of Tarnpirr	J. L. & E. I. Henderson	Jersey ..	5,167	5·59	288·64	Starbright's 5th Twylish
339	Gardinia of Seafield ..	G. Gange ..	Ayrshire	6,632	4·35	288·51	Philosopher of Glengowrie
340	Fuchsia of Warrook ..	Cockbill & Gibbs ..	„ ..	7,061	4·08	288·07	Alice's Jamie of Oakbank
341	Lena of Golden Vein ..	W. T. Cullen ..	„ ..	6,741	4·27	287·91	Bonnie Lad of Golden Vein
342	Peggy of Riccarton ..	W. T. Cullen ..	„ ..	6,542	4·45	287·90	White Prince of Gleneira
343	Red Pet	F. G. Sadler ..	Shorthorn	6,926	4·14	286·68	Royal Heir 7th
344	Blanchette 1st of St. Albans	A. W. Jones ..	Jersey ..	5,688	5·03	286·46	Sweet Fox
345	Science of Springhurst	Finn Bros. ..	„ ..	4,812	5·95	286·22	Brighton Cub
346	Netherlana	Department of Agriculture ..	Red Poll	7,363	3·89	286·10	Melford Prince
347	Mulberry of Ayrbrae ..	L. McFarlane ..	Ayrshire	7,556	3·79	286·10	Lancelot of Gleneira
348	Poppy of Ben Kell ..	R. Ralston ..	„ ..	6,148	4·65	285·09	Girvan of Oakbank
349	Iris 2nd of Carracoorte..	W. Henderson ..	„ ..	6,812	4·18	284·73	Victorious of Warrook
350	Woodnymph ..	Department of Agriculture	Friesian	9,834	2·81	284·52	Woodcrest Joe
351	Princess of Kudala ..	W. J. Colman ..	Jersey ..	5,943	4·78	284·06	Starbright Renard
352	Betsy 2nd of Carracoorte	W. Henderson ..	Ayrshire	6,141	4·62	283·74	Fritz of Rythdale
353	Victoria Red Rose ..	Department of Agriculture	Red Poll	6,354	4·46	283·66	Red David
354	Floss 2nd of Carracoorte	W. Henderson ..	Ayrshire	7,348	3·85	283·04	Rufus of Oakbank
355	Minnie of Warrook ..	W. Henderson ..	„ ..	5,924	4·77	282·87	Alice's Jamie of Oakbank
356	Daffodil Pine Hill ..	G. Rowe ..	Jersey ..	6,359	4·45	282·68	Starbright Carnation's Fox
357	Vanilla 7th of Melrose ..	W. Woodmason ..	„ ..	5,221	5·38	281·87	Pretty Noble
358	Prudence of Gleneira ..	R. C. Clymo ..	Ayrshire	6,288	4·48	281·59	Champion of Gleneira
359	Fairy of Warrook ..	Cockbill & Gibbs ..	„ ..	5,685	4·95	281·41	Minerva's Jamie of Warrook
360	Princess Dot	G. Rowe ..	Jersey	4,533	6·21	281·31	Kyabram Milklad
361	Boronia 2nd of Pine Grove	A. H. Schier ..	Ayrshire	6,294	4·46	281·14	Glen Keith of Pine Grove
362	Prunny of Golden Vein	J. H. Rogers ..	„ ..	7,774	3·62	281·05	Anither of Oakbank
363	Marguerite of Glengowrie	A. H. Schier ..	„ ..	6,193	4·53	280·37	Orpheus of Glengowrie
364	Tarrawarra No 10 ..	G. A. Waite ..	Friesian	7,061	3·96	280·06	Tarrawarra No. 2
365	Frolic of Sparrovale ..	Geelong Harbor Trust	Ayrshire	6,766	4·14	279·99	Kemp of Glenarthur
366	Mermaid of Shannon Vale	C. Bamford ..	„ ..	6,143	4·55	279·29	Oswald of Willowvale
367	Columbine of Springhurst	Mrs. I. Beard ..	Jersey ..	4,929	5·66	279·18	Young Defiance
368	Mahonga Butterfly 32nd	R. G. Morton ..	Shorthorn	6,977	4·00	279·18	Phingask Comet
369	Tulip of Meridale ..	F. W. Beischer ..	Jersey ..	4,905	5·68	278·65	Dinah's Twylish 2nd of Kingsvale
370	Susie	R. Lidgett ..	Shorthorn	6,680	4·17	278·52	Duke of Chester
371	Retford Fawn ..	Miss B. Reid ..	Jersey ..	5,215	5·32	278·45	Cherry's Pride 2nd
372	Annette 6th of Kingsvale	A. W. Findlay ..	„ ..	5,193	5·33	277·01	Carnation's Fancy Northwood King
373	Mode of Fernhill ..	H. D. W. Canobio	Ayrshire	6,721	4·12	276·92	Glen Elgin's Ian
374	Silverine of Inverleigh ..	A. G. Schier ..	„ ..	6,590	4·19	276·36	Marker of Balvormie
375	Lady Violet	R. Hall	„ ..	7,368	3·74	275·89	Peacemaker of Oakbank
376	Bess of Gleneira ..	A. H. Schier ..	Ayrshire	6,751	4·09	275·82	Rab of Gleneira
377	Maitland's Duchess of Lesterfield	A. W. Findlay ..	Jersey ..	6,937	3·98	275·81	Carnation's Fancy Northwood King
378	Morven Pansy 8th ..	Kerr Bros. ..	Shorthorn	7,605	3·62	275·65	Charming Duke 27th
379	Pentland's Bloom 2nd ..	R. Lidgett ..	„ ..	5,978	4·61	275·53	Duke of Chester
380	Peeress of Wyuna ..	R. H. Maher ..	Jersey ..	4,542	6·07	275·51	Buccanier
381	Possum of La Motte ..	J. Thorburn ..	Ayrshire	6,235	4·42	275·38	Captain Tasman
382	Lotus Lily 2nd of Staghorn	F. Bidgood ..	Jersey ..	5,350	5·14	275·17	Favourite's Noble of Kyora
383	Argus of Raith ..	Leslie & Gerrard ..	Ayrshire	7,738	3·54	274·86	Adela's Jamie of Raith
384	Sarah of Glen Alvie ..	G. Gange ..	„ ..	6,092	4·51	274·54	Triumph of Gleneira
385	Pearleen of Kilmarnock	Sadler Bros. ..	„ ..	7,648	3·59	274·44	Annie's Laird of Kilmarnock
386	Dorah of Glencourt ..	H. J. Munro ..	„ ..	5,921	4·63	274·14	Bonnie Chief of Gowrie Park
387	Tabitha of Gleneira ..	J. A. Lang ..	Ayrshire	6,402	4·28	274·13	Lad o' Kyle
388	Canary of Lesterfield ..	P. Chirnside ..	Jersey	5,180	5·29	274·06	Lesterfield Boy
389	Nellie of La Trobe ..	Sale High School ..	Ayrshire	6,053	4·53	274·04	Adela's Jamie of Raith

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire
				lbs.		lbs.	
390	Ada of Wethersdane ..	Sadler Bros. ..	Ayrshire	7,668	3·56	273·40	His Majesty of Wethersdane
391	Maitland's Petal 3rd ..	J. Scott	Jersey ..	5,386	5·08	273·36	Silver Belle's Golden Lad
392	Pet	J. W. Cochrane ..	Ayrshire	7,357	3·71	273·24	Carlo of Gleneira
393	Morven Daphne 10th ..	Kerr Bros. ..	Shorthorn	7,604	3·59	273·04	Manor York Rose
394	Proud Lassie of Yarra Brae	S. S. Cameron ..	Jersey ..	5,785	4·71	272·63	Laddie 10th
395	Countess of Golden Vein	W. T. Cullen ..	Ayrshire	7,343	3·71	272·36	Anither of Oakbank
396	Morven Queenie 10th ..	Kerr Bros. ..	Shorthorn	7,744	3·51	272·18	Charming Duke 27th
397	Lady Merlin of Colac ..	C. Falkenberg ..	Jersey ..	4,852	5·60	271·84	Merlin
398	Ada	R. Lidgett ..	Shorthorn	7,089	3·83	271·65	Charming Duke 27th
399	Jubilee Daffodil ..	Miss B. Reid ..	Jersey ..	5,584	4·68	271·28	Jubilee May's 2nd Prince
400	Violet's Queen of Dunachton	R. Hall	Ayrshire	7,005	3·87	271·24	Alpha of Oakvale
401	Heroine of Springvale ..	R. C. Campbell ..	Jersey ..	5,299	5·12	271·05	Jersey King
402	Goldleaf of Raith ..	Leslie & Gerrand ..	Ayrshire	6,385	4·24	270·84	Scottish King
403	Songstress of Glencourt	H. J. Munro ..	" ..	5,870	4·61	270·58	Bonnie Chief of Gowrie Park
404	Lady Mac 2nd of Gleneira	W. Henderson ..	" ..	6,698	4·04	270·47	Goldmines Majestic of Gleneira
405	Dominion Flower 2nd ..	Flack & Sewell ..	Friesian	7,684	3·52	270·42	Longbeach Primrose League
406	Rosebloom of Carracoorte	W. Henderson ..	Ayrshire	6,138	4·41	270·39	Victorious of Warrook
407	Glorious of Roxburgh ..	J. A. Lang ..	" ..	6,790	3·99	270·37	Jenny's Pride
408	Mabel of Simpson House	A. H. Schier ..	" ..	6,362	4·23	269·08	Annie's Luminous
409	Magenta 2nd of Burnside	L. F. Armstrong ..	" ..	5,615	4·79	268·92	Ventry of Seafield
410	Mayflower of Colac ..	C. Falkenberg ..	Jersey ..	4,576	5·87	268·72	Cowslip's Lad
411	Pentland's Bloom ..	R. Lidgett ..	Shorthorn	6,485	4·14	268·37	Highton Prince 3rd
412	Mabel of Simpson House	A. H. Schier ..	Ayrshire	6,259	4·28	267·98	Annie's Luminous
413	Cocky of Evergreen ..	H. S. Gibson ..	" ..	7,974	3·36	267·91	Duke of Wethersdane
414	Laurie 2nd of Roseneath	W. J. Coleman ..	Jersey ..	5,183	5·14	267·60	Dunalister's Noble
415	Primrose 2nd of Pine Grove	A. H. Schier ..	Ayrshire	6,603	4·05	267·12	Glen Keith of Pine Grove
416	Peerless of Dunachton	R. Hall	" ..	6,865	3·89	267·07	Alpha of Oakvale
417	Ivy 2nd of Wethersdane	G. Keys	" ..	6,999	3·81	266·99	Glen Elgin's Combine
418	Milkmaid of Riccarton	W. T. Cullen ..	" ..	6,437	4·14	266·42	White Prince of Gleneira
419	Beauty	R. Lidgett ..	Shorthorn	6,419	4·15	266·12	Highton Prince 3rd
420	Belle of Sparrovale ..	Geelong Harbor Trust	Ayrshire	6,070	4·38	265·68	Stuart of Gowrie Park
421	Unita of Burnside ..	J. H. Rogers ..	" ..	7,086	3·74	264·60	Zero of Rythdale
422	Dominion Queen Segis	Flack & Sewell ..	Friesian	7,916	3·22	264·46	Longbeach Primrose League
423	Lily 3rd of Holmwood	H. Luxton ..	Jersey ..	5,548	4·77	264·44	Audrey's Lord Twylish
424	Lady 2nd of Bonshaw ..	F. Trevaskis ..	" ..	5,521	4·78	264·02	Laddie 2nd of Banyule
425	Lotina's Lady ..	H. Luxton ..	" ..	5,949	4·42	262·78	Lotina's Larkspur's Twylish
426	Centague of Banyule ..	H. Perdriau ..	Ayrshire	5,979	4·56	262·45	The Lad of Banyule
427	Anthem (Imp.) ..	Miss S. L. Robinson	Jersey ..	5,338	4·90	261·49	Bright Prince
428	Buttercup of Carracoorte	W. Henderson ..	Ayrshire	6,467	4·04	261·20	Alice's Jamie of Oakbank
429	Bud 2nd of View Point	H. D. W. Canobio..	" ..	6,352	4·11	261·13	Glen Elgin's Ben
430	Beatrice of Sparrovale ..	Geelong Harbor Trust	" ..	7,125	3·63	259·49	Stuart of Gowrie Park
431	Flossie of Gleneira ..	W. Henderson ..	" ..	5,747	4·51	259·41	Triumph of Gleneira
432	Young Madeira of La Trobe	Sale High School ..	" ..	6,586	3·93	259·11	Norm of Mapleton
433	Mitre of Balvormie ..	A. H. Schier ..	" ..	5,738	4·51	258·92	Molly's Marshall of Balvormie
434	Bellona of Carracoorte	W. Henderson ..	" ..	5,919	4·37	258·66	Fritz of Rythdale
435	Pretty Polly of Glengowrie	J. H. Rogers ..	" ..	5,615	4·60	258·49	Glen Elgin's Orpheus
436	Morven Lizzie 7th ..	Kerr Bros. ..	Shorthorn	6,564	3·95	258·47	Manor York Rose
437	Wattle Blossom of Roseneath	W. J. Coleman ..	Jersey	5,182	4·99	258·44	Lotina's Noble of Oaklands
438	Nightingale 2nd of Raith	Leslie & Gerrand ..	Ayrshire	6,855	3·76	258·09	Duke of Melton Park
439	Lady Grey 6th of St. Albans	A. E. Batson ..	Jersey ..	4,634	5·56	257·80	Black Fox
440	Polly of Golden Vein ..	J. Benallack ..	Ayrshire	6,132	4·20	257·69	Anither of Oakbank
441	Manor Roan Daisy ..	R. G. Morton ..	Shorthorn	6,856	3·76	257·49	Manor Monarch
442	Collingwood Beauty ..	Department of Agriculture	Jersey ..	4,310	5·97	257·31	Lady's Fox of Collingwood
443	Bright Jewel of St. Albans.	R. Faragher ..	" ..	5,100	5·08	256·92	Silver Fox of Luscombe
444	Sheila 5th	Mrs. A. Black ..	" ..	4,951	5·18	256·57	Rufus
445	Mayflower of Seafield ..	W. Henderson ..	Ayrshire	6,743	3·79	255·76	Philosopher of Glengowrie
446	Mountain Princess of Langley Park	Callery Bros. ..	" ..	5,431	4·69	254·79	Bonnie's Chiel of Langley Park
447	Ruby of Burnbrae ..	Sadler Bros. ..	" ..	6,755	3·78	253·97	Favourite of Shipley
448	Dahlia of Retreat ..	Galbraith Bros. ..	" ..	5,705	4·43	253·11	Anthony of Gleneira
449	Blanche of Woodburn ..	J. Benallack ..	" ..	6,520	3·88	253·08	Sunshine's Pride of Woodburn
450	Madeira Flinders ..	Sale High School ..	" ..	6,471	3·91	253·05	Landlord
451	Viola 5th of Gleneira ..	W. Henderson ..	" ..	5,955	4·24	252·45	Triumph of Gleneira

COWS OVER 4 YEARS OF AGE OR ON THIRD LACTATION PERIOD—250 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
152	Gem of Roxburgh ..	J. A. Lang ..	Ayrshire	6,020	4·18	251·74	Glen Elgin's Grand Duke
153	Morven Lizzie 10th ..	Kerr Bros. ..	Shorthorn	7,107	3·54	251·41	Manor York Rose 10th
154	Rose of Welbourne ..	G. Rowe ..	Jersey ..	5,330	4·39	251·40	Audrey's Lad
155	Lady Mac 2nd of Gleneira	W. Henderson ..	Ayrshire	6,614	3·80	251·34	Goldmine's Majestic of Gleneira
156	Treasure of Ben Kell ..	R. Ralston ..	" ..	6,469	3·88	251·20	Girvan of Oakbank
157	Oatland's Tip.. ..	J. Thorburn ..	" ..	5,491	4·57	251·12	Young Poet
158	Morven Ruby ..	Kerr Bros. ..	Shorthorn	6,802	3·83	250·65	Manor York Rose
159	Pearl of Carracoorte ..	W. Henderson ..	Ayrshire	5,577	4·49	250·58	Fritz of Rythdale

Cows under 4 Years of Age—200 lbs. Standard.

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
1	Agnes of Warenda ..	T. Mesley ..	Jersey ..	7,779	6·40	497·72	Carrie 5th's Noble of Melrose
2	Ragtime of Warenda ..	T. Mesley ..	" ..	6,811	7·08	482·14	Carrie 5th's Noble of Melrose
3	Valda's Queen of Somerville	Finn Bros. ..	" ..	9,277	5·01	464·41	Rochdale King
4	Chevy 12th of Melrose..	J. Hunter ..	" ..	7,431	6·14	455·98	Handsome Boy 5th of Melrose
5	Queenie of Ashby ..	Dickinson Bros. ..	Friesian	10,906	4·01	440·29	Pearl's Prince of Brundee
6	Viola of Sparrovale ..	Geelong Harbor Trust	Ayrshire	9,261	4·69	434·34	Scottish King of Gowrie Park
7	Silvermine 18th of Banyule	Lyon and Kerr ..	Jersey ..	8,435	5·12	431·85	Mabel's Chief
8	Vixen of Tarnpirr ..	J. Hunter ..	" ..	8,192	5·26	431·27	Amy's Choice of Tarnpirr
9	Bluebell 2nd of Jerseyholm	T. Harvey ..	" ..	7,507	5.57	419·26	Emperor
10	Bolobek Bella ..	Kerr Bros. ..	Friesian	12,366	3·39	418·91	Indulge Johanna Lad
11	Lassie 7th Princess of Clover Flat	D. G. Tomkins ..	Jersey ..	8,775	4·76	417·48	Prince Noreen
12	Tulip Flower	A. W. Jones ..	Friesian	13.415	3·16	416·66	Canterbury Statesman
13	Beauty of Craigneil ..	A. W. Jones ..	" ..	10,777	3·84	413·94	Canterbury Statesman
14	Molly 6th of Banyule ..	Lyon and Kerr ..	Jersey ..	8,670	4·75	411·81	Audrey's Lord Twylish
15	Welcome of Tarnpirr ..	Estate Mrs. Alston	" ..	6,091	6·75	410·93	First Choice of Melrose
16	Graceful Duchess 19th of Melrose	W. Woodmason ..	" ..	6,296	6·42	403·98	Handsome Boy 5th of Melrose
17	Rarity 11th of Melrose..	J. Hunter ..	" ..	7,096	5·67	402·61	Handsome Boy 5th of Melrose
18	Coleus of Springhurst ..	C. Deverall ..	" ..	5,774	6·97	402·26	Brighton Cub
19	Kirsty 8th of Jerseyholm	T. Harvey ..	" ..	7,239	5·46	395·02	Emperor
20	Eidelweiss of Springhurst	J. D. Read ..	" ..	6,773	5·82	394·50	Fisher
21	Goldy of Strathbow ..	I. Raggatt ..	" ..	6,293	6·26	393·94	Mac of Tarnpirr
22	Virginia of Springhurst	J. D. Read ..	" ..	6,310	6·23	393·41	Haig of Springhurst
23	Laura 10th of Melrose ..	W. Woodmason ..	" ..	6,262	6·25	391·43	Handsome Boy 5th of Melrose
24	Lily of Holly Green ..	H. L. Webb ..	Ayrshire	8,327	4·69	390·61	Rex of Oakbank
25	Laura 12th of Melrose ..	R. H. Maher ..	Jersey ..	6,492	6·00	389·40	Golden Fern's Viscount
26	Springfield de Kol ..	Flack and Sewell ..	Friesian	8,484	4·59	389·32	Rosevale Inka Sylvia Posch
27	Ceilia of Woorayl ..	Leongatha High School	Jersey ..	7,186	5·39	387·53	Butter Boy
28	Cornflower of Springhurst	J. D. Read ..	" ..	7,432	5·18	384·90	Brighton Cub
29	Jenny Lind 13th of Melrose	R. H. Maher ..	" ..	6,529	5·89	384·71	Golden Fern's Viscount
30	Music of Warenda ..	T. Mesley ..	" ..	6,523	5·90	384·60	Jessie's Handsome Boy
31	Starleigh's Princess of Clover Flat	W. J. Coleman ..	" ..	7,004	5·45	381·65	Prince Noreen
32	Silvermine 20th of Banyule	Lyon and Kerr ..	" ..	6,443	5·90	380·17	Mabel's Chief
33	Wee Choice of Tarnpirr	A. W. Jones ..	" ..	5,339	7·11	379·70	Royal Rose's Choice
34	Empress of Springhurst	J. D. Read ..	" ..	7,166	5·28	378·36	Brighton Cub
35	Ransome of Craigneil ..	A. W. Jones ..	Friesian	12,808	2·94	377·09	Canterbury Statesman
36	St. Albans Gem ..	A. W. Jones ..	" ..	11,251	3·34	376·14	Pearl's Prince of Brundee
37	Trixie of Evergreen ..	H. S. Gibson ..	Ayrshire	8,406	4·45	375·29	General Gordon
38	Sparkle 3rd of Jerseyholm	T. Harvey ..	Jersey ..	6,002	6·14	369·53	Emperor
39	Lassie Fowler 7th of Melrose	W. Woodmason ..	" ..	6,371	5·77	367·90	Handsome Boy 5th of Melrose

Cows under 4 Years of Age—200 lbs. Standard—*continued*.

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
40	Countess Lulu of Corfield	Flack and Sewell ..	Friesian	10,570	3·47	366·92	De Kol Artis Rooker
41	Peerless 20th of Melrose	R. H. Maher ..	Jersey ..	6,603	5·45	360 71	Golden Fern's Viscount
42	Queenie of Bellarie ..	W. J. Coleman ..	" ..	6,859	5·26	350·57	Fox Trot
43	Quality 8th of Melrose	J. Hunter ..	" ..	6,072	5·88	357·15	Handsome Boy 5th of Melrose
44	Beauty 2nd of Bonshaw	P. J. Maloney ..	" ..	6,317	5·64	356·51	Laddie 2nd of Banyule
45	Queenie of Willow Park	W. K. Atkinson ..	Shorthorn	8,492	4·16	353·51	Havelock of Darbalara
46	Primrose 2nd of Melrose	R. H. Maher ..	Jersey ..	6,373	5·53	352·59	Golden Fern's Viscount
47	Myrtle of Springhurst ..	C. Deverall ..	" ..	5,801	6·01	348·84	Investigator of Melrose
48	Bolobek Amy.. ..	O. J. Syme ..	Friesian	10,482	3·32	348·63	Rhoda Prince of Rubicon
49	Fay of Banyule ..	H. Perdriau ..	Ayrshire	8,765	3·98	348·18	Rational of Oakbank
50	Mabel's Petal of Banyule	Lyon and Kerr ..	Jersey ..	6,367	5·46	347·42	Mabel's Chief
51	Brown Bess of La Motte	S. A. Johnson ..	Ayrshire	7,529	4·57	343·83	Captain Tasman
52	Peerless 20th of Melrose	W Woodmason ..	Jersey ..	6,348	5·40	343·08	Handsome Boy 5th of Melrose
53	Maid's Princess 2nd of Clover Flat	F. Raggatt ..	" ..	6,646	5·10	338·77	Prince Noreen
54	Duchess of Willow Park	W. K. Atkinson ..	Shorthorn	9,129	3·70	337·52	Havelock of Darbalara
55	Myra of Langley Park ..	Callery Bros.	Ayrshire	8,540	·94	336·52	Playaway of Willowvale
56	ardon of Ben Kell ..	R. Ralston ..	" ..	7,917	4·24	335·52	Girvan of Oakbank
57	Jessamine of La Motte	S. A. Johnson ..	" ..	8,120	4·12	334·35	Captain Tasman
58	Gingercake of Glen Iris	P. Chirnside ..	Jersey ..	5,996	5·53	331·51	Brown Chief
59	Countess of Willow Park	W. K. Atkinson ..	Shorthorn	7,271	4·55	330·07	Havelock of Darbalara
60	Meg of Elthamleigh ..	O. Cutler.. ..	Jersey ..	6,107	5·40	330·01	Lucius 2nd
61	Picotee of Springhurst	J. D. Read ..	" ..	6,488	5·08	329·32	Brighton Cub
62	Leonora Canary (Imp.)	Flack and Sewell ..	Friesian	8,076	4·07	329 05	Sir Canary Pietji
63	St. Albans Lady ..	A. W. Jones ..	" ..	8,206	4·00	328·50	Pearl's Prince of Brundee
64	Fancy Queen of Ferndale	D. C. Miller ..	Jersey ..	6,591	4·93	325·05	Lord Grey of St. Albans
65	Peerless 18th of Melrose	W. Woodmason ..	" ..	5,502	5·89	324·18	Golden Fern's Viscount
66	Lotus of Burnbrae ..	Sadler Bros. ..	Ayrshire	7,584	4.27	323·52	Laura's Laird of Gowrie Park
67	Vanilla 13th of Melrose..	R. H. Maher ..	Jersey ..	6,202	5·21	323·28	Golden Fern's Viscount
68	Linda 2nd of Bonshaw..	Mrs. E. M. Lennie..	" ..	6,313	5·10	322·24	Laddie 2nd of Banyule
69	May of Clover Flat ..	F. Raggatt ..	" ..	6,164	5·13	316·43	Prince Noreen
70	Annetta of View Point	H. D. W. Canobio	Ayrshire	7,966	3·96	315·52	Jimmie of View Point
71	Blossom of Sparrovale	Geelong Harbor Trust	" ..	6,319	4·99	315·48	Stuart of Gowrie Park
73	Heroine of Springvale ..	R. C. Campbell ..	Jersey ..	6,135	5·13	315·32	Jersey King
73	Bolobek Ruby ..	O. J. Syme ..	Friesian	10,403	3·03	315·27	Rhoda Prince of Rubicon
74	Nellie of Craigneil ..	A. W. Jones ..	" ..	8,258	3·80	314·14	King Mercena
75	Annie of Holly Green ..	H. L. Webb ..	Ayrshire	7,814	4·02	313·82	Prince of Holly Green
76	Nemophila of Springhurst	J. D. Read ..	Jersey ..	5,362	5·76	309·06	Investigator of Melrose
77	Pretty of Retreat ..	W. J. Muhleback ..	Ayrshire	7,120	4·30	306·28	Musician of Willowvale
78	Duchess of Evergreen ..	H. S. Gibson ..	" ..	7,584	4·03	305·74	General Gordon
79	Bainfield No. 40 ..	Flack and Sewell ..	Friesian	8,548	3·56	304·44	Medbury Prince
80	Primrose of Sparrovale	Geelong Harbor Trust	Ayrshire	6,421	4·70	302·08	Scottish King of Gowrie Park
81	Woodruff Lady Monda..	Lyon and Kerr ..	Jersey ..	5,960	5·06	301·64	Lord Richmond
82	Rosalena	Leongatha High School	" ..	4,745	6·30	300·90	Butter Boy
83	Marie of Bonshaw ..	P. J. Maloney ..	" ..	6,448	4·60	296·67	Laddie 2nd of Banyule
84	Daisy of Bignold ..	F. W. Beischer ..	" ..	5,814	5·09	296·19	Beauty 3rd's Fox
85	Bolobek Ursula ..	O. J. Syme ..	Friesian	7,943	3·85	295·53	Rhoda Prince of Rubicon
86	Bonnie of Glencairn ..	J. H. Rogers ..	Ayrshire	9,030	3·26	295·53	Zero of Rythdale
87	Nico Noco	Department of Agriculture	Red Poll	7,021	4·20	294·85	Nicotine
88	Little Virtue of Ellerslie	L. McFarlane ..	Ayrshire	6,325	4·64	293·64	Leila's Jamie of Ellerslie
89	Chance of Golden Vein..	W. McIvor ..	" ..	7,376	3·97	292·61	Sergeant of Golden Vein
90	Noorat Grey Girl ..	Mrs. A. Black ..	Jersey ..	5,865	5·00	292·18	Obelisk
91	Floss of Sparrovale ..	Geelong Harbor Trust	Ayrshire	7,137	4·07	290·64	Scottish Chief of Sparrovale
92	Kyora Merry Mike's Mayflower	Miss L. Robinson ..	Jersey ..	6,021	4·80	289·27	Merry Mike
93	Emily of Riccarton ..	J. A. Lang ..	Ayrshire	6,671	4·33	288·60	White Prince of Gleneira
94	Queen Mary of Gleneira	L. McFarlane ..	" ..	7,539	3·81	287·60	Beau of Gleneira
95	Cambria	Mrs. M. E. Carroll	Red Poll	6,900	4·17	287·46	Nicotine
96	Melba of Sparrovale ..	Geelong Harbor Trust	"	6,378	4·50	287·04	Scottish King of Gowrie Park
97	Prue 2nd of Carracoorte	W. Henderson ..	Ayrshire	6,236	4·59	286·46	Lord Dudley of Gowrie Park
98	Roseleaf of Langley Park	Callery Bros. ..	" ..	5,799	4·94	286·33	Bonnie's Chiel of Victoria Bank
99	Lassie Fowler 8th of Melrose	R. H. Maher ..	Jersey ..	4,897	5·83	285·39	Golden Fern's Viscount
100	Hilda 2nd of Raith ..	Leslie and Gerrand	Ayrshire	7,514	3·79	285·09	Ronald of Raith
101	Verbena of Warrook ..	Cockbill and Gibbs	" ..	6,638	4·20	283·14	Fritz of Warook

COWS UNDER 4 YEARS OF AGE—200 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
102	Lupin of Medburn Grove	C. Bamford ..	Ayrshire	7,047	4·00	282·39	St. Elfred of Willowvale
103	Lady Grey 9th of St. Albans	A. W. Jones ..	Jersey ..	4,653	6·04	281·10	Sweet Fox 2nd of St. Albans
104	Peeress of St. Albans ..	T. R. Findlay ..	,, ..	5,202	5·36	278·87	Sweet Fox 2nd of St. Albans
105	Empress of Langley Park	Callery Bros. ..	Ayrshire	6,266	4·44	278·37	Playaway of Willowvale
106	Adelia's Pet of Inverleigh	A. H. Schier ..	,, ..	5,624	4·85	272·73	Major of Gowrie Park
107	Pride of Wattle Bank ..	A. Kirby	,, ..	6,110	4·45	272·12	Brownie of Gowrie Park
108	Myrtle of Sparrovale ..	Geelong Harbor Trust	,, ..	5,764	4·69	270·54	Scottish Chief of Sparrovale
109	Mary of Oakbank ..	Cockbill and Gibbs	,, ..	5,994	4·51	270·06	Brilliant Star of Oakbank
110	Beauty of Medburn Grove	C. Bamford ..	,, ..	6,432	4·14	266·32	St. Elfred of Willowvale
111	Silverine of Inverleigh ..	A. H. Schier ..	,, ..	5,723	4·62	264·75	Marker of Balvormie
112	Graceful of Roxburgh ..	T. Douglas ..	,, ..	5,295	4·99	264·16	Jock of Roxburgh
113	Katie	R. G. Dent ..	Red Poll	5,411	4·84	262·04	Borcum
114	Tilly Lantry 2nd of Warenda	T. Mesley ..	Jersey ..	4,300	6·08	261·53	Jessie's Handsome Boy
115	Queenie of Langley Park	Callery Bros. ..	Ayrshire	4,987	5·22	260·55	Playaway of Willowvale
116	Mulberry of Ayrbrae ..	L. McFarlane ..	,, ..	6,380	4·05	258·39	Lancelot of Gleneira
117	Moel of Langley Park ..	Callery Bros. ..	,, ..	6,347	4·07	258·37	Playaway of Willowvale
118	Venus of Dunachton ..	R. Hall	,, ..	7,120	3·62	257·51	Ronald of Raith
119	Canary 11th of Kingsvale	Mrs. F. M. Akehurst	Jersey ..	4,128	6·19	255·48	Carnation's Fancy Northwood King
120	Welcome of Ben Keil ..	R. Ralston ..	Ayrshire	7,203	3·54	255·06	Girvan of Oakbank
121	Charm of Golden Vein	J. A. Lang ..	,, ..	6,058	4·21	254·94	Bonnie Lad of Golden Vein
122	Morocco's Choice of Kirkhill	D. C. Miller ..	Jersey ..	4,121	6·18	254·84	Blanchette's Fox
123	Bluebell 2nd of Carracoorte	W. Henderson ..	Ayrshire	5,568	4·55	253·47	Fritz of Rythdale
124	Dolly Brown of Inverleigh	A. H. Schier ..	,, ..	6,587	3·85	253·37	Index of Balvormie
125	Iris of Wethersdane ..	G. Keys	,, ..	6,003	4·20	252·39	His Majesty of Wethersdane
126	Heather of Winslade ..	L. McFarlane ..	,, ..	5,217	4·83	251·91	Bowler of Seafield
127	Bloom of Roxburgh ..	W. T. Cullen ..	,, ..	5,748	4·37	251·56	Gallant Duke
128	Pearl of Ferndale ..	D. C. Miller ..	Jersey	5,073	4·95	251·03	Lord Grey of St. Albans
129	Bunty 3rd of Carracoorte	W. Henderson ..	Ayrshire	5,275	4·74	250·26	Lord Dudley of Gowrie Park
130	Noorat Flashlight 2nd ..	Mrs. A. Black ..	Jersey ..	5,019	4·96	248·78	Milklad of Banyule
131	Flossie of Carracoorte ..	W. Henderson ..	Ayrshire	5,473	4·54	248·67	Bruin of Gleneira
132	Ornitha	Department of Agriculture	Red Poll	5,147	4·80	247·13	Nicotine
133	Ada 2nd of Carracoorte	W. Henderson ..	Ayrshire	6,006	4·11	246·98	Lord Dudley of Gowrie Park
134	Verbena of Retreat ..	W. J. Muhlebach ..	,, ..	5,013	4·91	246·44	Musician of Willowvale
135	Greta of Burnbrae ..	Sadler Bros. ..	,, ..	6,608	3·73	246·16	Laura's Laird of Gowrie Park
136	Violet of Retreat ..	W. Meredith ..	,, ..	6,227	3·94	245·14	Musician of Willowvale
137	Laodicea	Department of Agriculture	Red Poll	5,433	4·51	244·85	Belligerent
138	Flanderina	Department of Agriculture	,, ..	5,911	4·14	244·77	Nicotine
139	Morven Duchess 17th ..	Kerr Bros. ..	Shorthorn	6,168	3·97	244·65	Manor York Rose 10th
140	Jessica of Banyule ..	Lyon and Kerr ..	Jersey ..	3,942	6·78	243·80	Investigator of Melrose
141	Juliet of Carracoorte ..	W. Henderson ..	Ayrshire	5,313	4·58	243·40	Lord Dudley of Gowrie Park
142	Yum Yum	G. A. Waite ..	Friesian	6,091	3·98	242·82	Count Togo
143	Marcia of Woolamai Park	G. Kent	Ayrshire	6,517	3·71	241·75	Marcus of Holly Green
144	Ada of Wattle Bank ..	A. Kirby ..	,, ..	5,674	4·23	239·94	Brownie of Gowrie Park
145	Lady of Targoora ..	J. L. and E. I. Henderson	Jersey ..	4,683	5·09	238·32	Lotina's Defender of Kyora
146	Edith 5th of Hillfield ..	F. Sadler.. ..	Shorthorn	6,121	3·88	237·46	43rd Earl of Pentland
147	Lady Jar 4th of Gleneira	F. McIver ..	Ayrshire	6,284	3·76	236·35	Jock of Gowan Bank
148	Balm of Carracoorte ..	W. Henderson ..	,, ..	5,557	4·25	236·26	Victorious of Warrook
149	Rosebloom 2nd of Carracoorte	W. Henderson ..	,, ..	5,771	4·08	235·80	Victor 2nd of Carracoorte
150	Duchess of Darley ..	R. G. Morton ..	Shorthorn	6,674	3·53	234·61	Morven Myrtle Duke
151	Chance	T. H. Payne ..	Red Poll	5,772	4·05	233·75	Honingham Alake 3rd
152	Docy of Riccarton ..	W. T. Cullen ..	Ayrshire	6,074	3·83	232·68	White Prince of Gleneira
153	Petti Sing	G. A. Waite ..	Friesian	5,744	4·03	231·37	Count Togo
154	Bloom of Ben Keil ..	G. Vallance ..	,, ..	5,258	4·37	229·90	Girvan of Oakbank
155	Springfield Molly ..	Flack and Sewell ..	,, ..	6,057	3·79	229·56	Rosevale Inka Sylvia Posch
156	Sparkle 2nd of Carracoorte	W. Henderson ..	Ayrshire	5,138	4·45	228·46	Lord Dudley of Gowrie Park
157	Esme 2nd of Riccarton..	J. A. Lang ..	,, ..	6,243	3·65	227·75	White Prince of Gleneira
158	Dainty 2nd of Carracoorte	W. Henderson ..	,, ..	4,645	4·90	227·45	Bruce of Warrook
159	Morven Duchess 16th ..	Kerr Bros. ..	Shorthorn	5,710	3·96	226·15	Manor York Rose 10th
160	Melody of Fernhill ..	A. Kirby ..	Ayrshire	5,849	3·85	225·47	Renown of Oakbank
161	Lady Grey 10th of St. Albans	A. W. Jones ..	Jersey ..	4,411	5·07	223·66	Sweet Fox 2nd of St. Albans
162	Pink of Springhurst ..	J. D. Read ..	,, ..	4,906	4·51	221·41	Kitchener
163	Noorat Sheila.. ..	Mrs. A. Black ..	,, ..	4,196	5·27	221·38	Obelisk

COWS UNDER 4 YEARS OF AGE—200 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
164	Ruby of Riverside ..	J. H. Rogers ..	Ayrshire	5,558	3·98	221·30	Adela's Jamie of Ellerslie
165	Velvet of Wethersdane..	W. and J. Cockbill	" ..	5,134	4·30	220·59	His Majesty of Wethersdane
166	Daisy Posch Artis of Corfield	Flack and Sewell ..	Friesian	6,097	3·60	219·38	De Kol Artis Rooker
167	Fairy of Burnbrae ..	Sadler Bros. ..	Ayrshire	6,392	3·42	218·74	Bonnie King of Gowrie Park
168	Princess of Burnbrae ..	Sadler Bros. ..	" ..	4,677	4·68	218·66	Bonnie King of Gowrie Park
169	Werribee Northern Larkspur 3rd	A. W. Findlay ..	Jersey ..	3,899	5·61	218·60	Island Butter King
170	Gertie 3rd of Carracoorte	W. Henderson ..	Ayrshire	4,451	4·91	218·45	Victorious of Warrook
171	Vanity of Burnside ..	R. Goodman ..	" ..	5,214	4·17	217·65	Gregor of Oakbank
172	Mary of Ayrbrae ..	L. McFarlane ..	" ..	5,680	3·83	217·55	Harmonist of Ellerslie
173	Helna of Carracoorte ..	W. Henderson ..	" ..	5,109	4·22	215·35	Lord Dudley of Gowrie Park
174	Viola of Carracoorte ..	W. Henderson ..	" ..	4,901	4·38	214·47	Victorious of Warrook
175	Affinity of Oakbank ..	W. Meredith ..	" ..	5,236	4·09	214·13	Gallant of Oakbank
176	Ada of Roseleigh ..	G. Gange ..	" ..	5,305	3·99	212·81	Burleigh of Gowrie Park
177	Violet 2nd of Carracoorte	W. Henderson ..	" ..	4,136	5·14	212·74	Lord Dudley of Gowrie Park
178	Elena of Springfield ..	M. and W. A. Francis	" ..	5,043	4·22	212·67	Donald of Wethersdane
179	Peeress of Ayrbrae ..	L. McFarlane ..	" ..	4,814	4·40	211·89	Earl of Drayton
180	Buttercup 3rd of Bonshaw	Mrs. E. M. Lennie..	Jersey ..	3,850	5·49	211·22	Laddie 2nd of Banyule
181	Cloverleaf of Medburn Grove	C. Bamford ..	Ayrshire	5,474	3·85	210·80	St. Elfred of Willowvale
182	Toronto	Department of Agriculture	Red Poll	4,230	4·93	209·76	Belligerent
183	Mayflower of Carracoorte	W. Henderson ..	Ayrshire	5,911	3·54	209·50	Cocky Rab of Gleneira
184	Beauty's Daphodil of Lesterfield	P. Chirnside ..	Jersey ..	4,255	4·89	208·10	Lesterfield Handsome Boy
185	Clarice of Burnbrae ..	Sadler Bros. ..	Ayrshire	4,999	4·15	207·48	Laura's Laird of Gowrie Park
186	Jessie 23rd of Melrose ..	E. A. Denis ..	Jersey ..	3,288	6·27	206·29	Golden Fern's Viscount
187	Maud 2nd	Cockbill and Gibbs	Ayrshire	5,014	4·06	203·64	The Drummer
188	Morven Lizzie 9th ..	Kerr Bros. ..	Shorthorn	4,781	4·25	203·36	Morven Charming Duke 2nd
189	Carine of Clarendoneyre	C. J. Reid ..	Jersey ..	3,907	5·20	203·27	Lotina's Larkspur Twylish
190	Laura of Dunachton ..	R. Hall	Ayrshire	5,476	3·71	203·10	Adela's Jamie of Raith
191	Myrtle 2nd of Jersey Vale	Mrs. L. Orchard ..	Jersey	3,657	5·55	202·96	Golden Twylish
192	Jubilee Violet ..	Miss B. Reid ..	" ..	3,513	5·72	200·98	Twylish Madeira's Fox 2nd
193	Rita of Inverleigh ..	A. H. Schier ..	Ayrshire	4,964	4·04	200·51	Lavendo of Gleneairn
194	Jubilee Willoh ..	Miss B. Reid ..	Jersey ..	4,072	4·92	200·37	Twylish Madeira's Fox 2nd

Heifers—175 lbs. Standard.

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
1	Agnes of Warenda ..	T. Mesley ..	Jersey ..	8,307	6·35	527·20	Carrie's 5th Noble of Melrose
2	Garenne 4th of Warenda	T. Mesley ..	" ..	7,180	6·05	434·35	Jessie's Handsome Boy
3	Meadow Sweet of Warenda	T. Mesley ..	" ..	6,551	6·16	403·74	Jessie's Handsome Boy
4	Empress 3rd of Holmwood	T. Harvey ..	" ..	6,890	5·81	400·43	Emperor
5	Boronia of Sparrovale	Geelong Harbor Trust	Ayrshire	8,824	4·53	399·76	Jamie of Sparrovale
6	Cutty Sark	Department of Agriculture	Red Poll	8,473	4·40	373·12	Belligerent
7	Princess 2nd of Grangelea	A. A. Broad ..	Jersey ..	6,880	5·40	371·53	Grey Lad
8	Little Queen of Warenda	T. Mesley ..	" ..	6,584	5·61	369·66	Jessie's Handsome Boy
9	Molly 6th of Banyule ..	Lyon and Kerr ..	" ..	8,035	4·51	362·34	Audrey's Lord Twylish
10	Chorus Girl of Banyule	Lyon and Kerr ..	" ..	6,759	5·35	361·28	Audrey's Lord Twylish
11	Bolobek Annie ..	O. J. Syme ..	Friesian	9,377	3·82	357·84	Rhoda Prince of Rubicon
12	Lucy Grey of Colac ..	T. R. Findlay ..	Jersey ..	6,892	5·19	357·37	Lady Grey 4th's Fox
13	Butterlass of Belgonia ..	P. J. Maloney ..	" ..	7,439	4·80	356·72	Laddie 2nd of Banyule
14	Lady Dulcie of Ben Kell	R. Ralston ..	Ayrshire	8,389	4·25	356·35	Marvel of Willowvale
15	Monavale Catronia Paxton	Flack and Sewell ..	Friesian	9,027	3·88	356·00	Prince Pietje Paxton
16	Babs of Somerville ..	J. Hutchinson ..	Jersey ..	6,827	5·08	347·04	Daphne's Prince
17	Phyllis 3rd of Ashby ..	Dickinson Bros. ..	Friesian	8,885	3·83	340·02	St. Albans' May King
18	Lily of Craignell ..	A. W. Jones ..	" ..	8,402	4·03	338·44	Canterbury Statesman
19	Molly 7th of Banyule ..	Lyon and Kerr ..	Jersey.	7,241	4·65	336·40	Audrey's Lord Twylish

HEIFERS—175 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
20	Flower 14th of Melrose	A. L. Walter ..	Jersey ..	5,264	6·35	334·01	Golden Fern's Viscount
21	Alvie of Roseleigh ..	G. Gange ..	Ayrshire	7,297	4·53	330·71	Burleigh of Gowrie Park
22	Fairy Queen of Springvale	R. C. Campbell ..	Jersey ..	5,666	5·81	329·14	Comedy King
23	Highland Queen of Evergreen	H. S. Gibson ..	Ayrshire	7,472	4·38	327·32	Luminous of Drayton
24	Clover of Saranac ..	R. Faragher ..	Jersey ..	5,867	5·58	327·22	Lord Richmond
25	Forty Winks ..	J. Scott	" ..	6,347	5·14	326·39	Lotina's Defender of Kyora
26	Handsome Girl 9th of Melrose	W. Woodmason ..	" ..	5,094	6·41	326·36	Golden Fern's Viscount
27	Monavale Juno Paxton	J. Platfuss ..	Friesian	9,766	3·34	325·97	Prince Pietje Paxton
28	Leura of Burnbrae ..	Sadler Bros. ..	Ayrshire	7,018	4·64	325·57	Bonnie King of Gowrie Park
29	Cherry of Willow Park..	W. K. Atkinson ..	Shorthorn	8,733	3·72	324·67	Havelock of Darbalara
30	Beautiful of Retreat ..	W. J. Muhlebach ..	Ayrshire	7,145	4·54	324·49	Musician of Willowvale
31	Blanche of Willow Park	W. K. Atkinson ..	Shorthorn	7,820	4·11	321·77	Havelock of Darbalara
32	Lady Grey 12th of St. Albans	A. W. Jones ..	Jersey	5,732	5·60	321·01	Admiral 2nd
33	Bolobek Dot	O. J. Syme ..	Friesian	9,175	3·46	317·42	Rhoda Prince of Rubicon
34	Cream Belle 3rd of Gnarbrook	A. W. Jones ..	Jersey ..	5,463	5·76	314·69	Sir Antonio
35	Jenny Lind 15th of Melrose	W. Woodmason ..	" ..	5,697	5·52	314·28	Golden Fern's Viscount
36	Thora 7th of Banyule ..	Lyon and Kerr ..	" ..	5,748	5·42	311·47	Audrey's Lord Twylish
37	Buttermaid 2nd ..	A. W. Jones ..	Friesian	7,873	3·95	311·03	King Mercena
38	Phyllis 2nd of Warenda	T. Mesley ..	Jersey ..	5,788	5·36	310·45	Jessie's Handsome Boy
39	Valdas Belle of Somerville	J. Hutchinson ..	" ..	5,404	5·74	310·40	Daphne's Prince
40	Muriel 2nd of Somerset	A. E. Batson ..	" ..	5,631	5·48	307·61	Lady Grey 2nd's Golden Spark
41	Cantata of Banyule ..	Lyon and Kerr ..	" ..	5,907	5·21	307·51	Audrey's Lord Twylish
42	Sunbeam of Somerville	H. Luxton ..	" ..	5,445	5·64	306·93	Daphne's Prince
43	Statutte 3rd of Banyule	Lyon and Kerr ..	" ..	5,701	5·38	306·92	Lord Silvermine 8th
44	Segis Hengerveld of Lydholme	Flack and Sewell ..	Friesian	8,580	3·58	306·82	Cluney Hengerveld of Lydholme
45	Daisy 12th of Melrose ..	W. Woodmason ..	Jersey ..	5,556	5·49	305·11	Golden Fern's Viscount
46	Belle A	R. Faragher ..	" ..	5,890	5·18	304·98	Bell Boy of Hillcrest
47	Maudie 2nd of Retreat	N. Gange ..	Ayrshire	7,952	3·83	304·76	Musician of Willowvale
48	Primrose of Winslade ..	C. Lees	" ..	6,046	5·04	304·67	Bowler of Seafield
49	Molly 8th of Banyule ..	Lyon and Kerr ..	Jersey ..	5,516	5·50	303·53	Milkmaid's Chief
50	Neat Lady of Springvale	R. C. Campbell ..	" ..	5,348	5·64	301·37	Admiral
51	Pansy 6th of Ferntree Vale	E. A. Denis ..	" ..	5,336	5·58	297·54	Starbright Renard
52	Chromate of Banyule ..	Lyon and Kerr ..	" ..	5,836	5·09	296·93	Audrey's Lord Twylish
53	Modesty 2nd of Retreat	W. J. Muhlebach ..	Ayreshire	6,204	4·78	296·60	Musician of Willowvale
54	Attraction	S. S. Cameron ..	Jersey ..	4,916	6·02	296·17	Attraction's Fox
55	Jessie 11th of Ferntree Vale	J. Phillips ..	" ..	7,290	4·05	295·57	Starbright Renard
56	Joy of Tarnpirr ..	F. Trevaskis ..	" ..	5,224	5·65	294·94	My Queen's Choice
57	Brabantia	Department of Agriculture	Red Poll	6,429	4·59	294·78	Nicotine
58	Belle of Craigneil ..	A. W. Jones ..	Freisian	8,207	3·58	294·23	De Kol of Canada
59	Countess Lulu of Corfield	Flack and Sewell ..	" ..	7,422	3·95	293·10	De Kol Artis Rooker
60	Romneya of Springhurst	J. D. Read ..	Jersey ..	5,698	5·14	292·70	Petain
61	Butter Queen of Meryula	A. W. Jones ..	" ..	5,531	5·28	292·05	Meryula
62	Dido 3rd of Banyule ..	Lyon and Kerr ..	" ..	5,796	5·03	291·78	Audrey's Lord Twylish
63	Rose of Langley Park ..	Callery Bros. ..	Ayrshire	7,540	3·86	291·37	Playaway of Willowvale
64	Lotus of Banyule ..	Lyon and Kerr ..	Jersey ..	5,680	5·12	290·76	Clementine's King
65	Countess 2nd of Springhurst	J. D. Read ..	" ..	5,624	5·16	290·00	Attraction of Springhurst
66	War Wings	Department of Agriculture	Red Poll	6,828	4·32	288·76	Longford Major
67	Bonnie Queen of Burnbrae	Sadler Bros. ..	Ayrshire	7,572	3·81	288·14	Bonnie King of Gowrie Park
68	Queen Curly	A. W. Jones ..	Friesian	8,402	3·43	287·99	King Mercena
69	Nettle of Burnbrae ..	Sadler Bros. ..	Ayrshire	7,384	3·89	285·57	Bonny King of Gowrie Park
70	Silvermine 21st of Banyule	Lyon and Kerr ..	Jersey ..	5,038	5·65	284·55	Audrey's Lord Twylish
71	Twill of Banyule ..	Lyon and Kerr ..	" ..	6,095	4·67	284·48	Audrey's Lord Twylish
72	Hibiscus of Springhurst	J. D. Read ..	" ..	6,214	4·57	284·22	Petain
73	Kitty 2nd of Somerset	A. E. Batson ..	" ..	4,453	6·38	284·18	Lady Grey 2nd's Golden Spark
74	Linda of Medburn Grove	C. Bamford ..	Ayrshire	6,860	4·14	283·83	Lord Harry
75	Sweet Briar of Targoora	W. H. Waycott ..	Jersey	5,947	4·76	282·91	Lotina's Defender
76	Mighty Atom of Wethersdane	G. Keys	Ayrshire	5,689	4·94	282·35	His Majesty of Wethersdane
77	Brilliant 2nd of Kilmarnook	Sadler Bros. ..	" ..	6,353	4·60	282·31	Laura's Laird of Gowrie Park
78	Cordyline Inka de Kol	A. W. Jones ..	Friesian	7,545	3·74	282·12	Cordyline Colantha Hero

HEIFERS—175 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
79	Fidget 2nd of Warrook	Cockbill and Gibbs	Ayrshire	6,689	4·21	281·76	Lena's Frederick
80	Heather Belle of Ayrbrae	L. McFarlane ..	"	6,492	4·32	281·45	Harmonist of Ellerslie
81	Melilot of Springhurst ..	J. D. Read ..	Jersey ..	5,114	5·50	281·18	Petain
82	Eva 2nd of Glencairn ..	G. Gange ..	Ayrshire	6,652	4·21	279·89	Levendo of Glencairn
83	Pico	Department of Agriculture	Red Poll	6,844	4·07	278·75	Belligerent
84	Miss Muller 2nd of Berry	Flack and Sewell ..	Friesian	7,478	3·72	278·17	Marquis of Newport
85	Gladys of Sparrovale ..	Geelong Harbor Trust ..	Ayrshire	5,883	4·73	278·13	Scottish King of Gowrie Park
86	St. Alban's Helen ..	A. W. Jones ..	Friesian	8,050	3·45	277·64	Burdett's Pride
87	Queen of Wollingurry ..	A. Joshua ..	Jersey ..	5,522	5·02	277·44	Soprano's Mystifier of Warragaburar
88	Velvet of Wetherdsane ..	G. Keys	Ayrshire	6,038	4·59	277·30	His Majesty of Wetherdsane
89	Sir Fancy's Larkspur ..	F. Bidgood ..	Jersey ..	5,572	4·97	277·10	Sir Fancy's Madeira of Werribee
90	Gaybelle of Wethersdane	G. Keys	Ayrshire	6,449	4·28	276·29	His Majesty of Wethersdane
91	Topsy of Evergreen ..	H. S. Gibson ..	" ..	6,555	4·19	274·46	Luminous of Drayton
92	Jessie of Welbourne ..	G. Rowe ..	Jersey ..	5,880	4·66	274·27	Young Premier
93	St. Alban's Bess ..	A. W. Jones ..	Friesian	8,302	3·30	273·90	Burdett's Pride
94	Bolobek Blue Bell ..	O. J. Syme ..	" ..	8,284	3·31	273·83	Johanna Lad
95	Waituki Princess Abigail	A. W. Jones ..	" ..	8,039	3·38	272·02	Royal Prince Pietertji de Kol
96	Peerless of Meadow Vale	J. Hunter ..	Jersey ..	4,345	6·25	271·77	Handsome Lad
97	Victoria Corunna ..	Department of Agriculture	Friesian	7,635	3·55	271·08	Dominion Domino's Dutch Boy
98	Pearl of Langley Park ..	Callery Bros. ..	Ayrshire	5,926	4·57	270·70	Playaway of Willowvale
99	Gold Lass of Brookside	W. Tendeson ..	Jersey ..	5,796	4·66	270·10	Renard's Twylish
100	Honey of Wanalta ..	C. W. W. Macauley	" ..	5,428	4·95	268·74	Noble Voice of Banyule
101	Marguerite of Springhurst	J. D. Read ..	" ..	4,912	5·46	268·13	Petain
102	Plumbago of Springhurst	J. D. Read ..	" ..	5,282	5·05	267·56	Petain
103	Favourite of Ben Kell ..	R. Ralston ..	Ayrshire	5,987	4·47	267·45	Marvel of Willowvale
104	Kirsty 11th of Jerseyholm	T. Harvey ..	Jersey ..	5,076	5·27	267·37	Emperor
105	Lorikeet of Banyule ..	Lyon and Kerr ..	" ..	6,238	4·38	267·16	Audrey's Lord Twylish
106	Quality's Duchess of Lesterfield	A. W. Findlay ..	" ..	4,832	5·52	266·81	Quality 6th's Son of Melrose
107	Princess of Coralee ..	Flack and Sewell ..	Friesian	7,684	3·44	264·59	Duke of Antwerp
108	Spot of Medburn Grove	C. Bamford ..	Ayrshire	5,778	4·58	264·58	St. Elfred of Willowvale
109	Boronia of Woodbyrne ..	J. Benaliack ..	" ..	6,245	4·23	263·91	Bailee of Oakbank
110	Soverign	Department of Agriculture	Red Poll	5,940	4·44	263·44	Belligerent
111	Sumontina	Department of Agriculture	" ..	6,285	4·61	263 34	Belligerent
112	Starleigh of Strathbow ..	F. Raggatt ..	Jersey	4,730	5·53	261·65	Mac of Tarnpirr
113	Maudie of Riccarton ..	J. A. Lang ..	Ayrshire	6,170	4·23	260·81	Chief of Riccarton
114	Viola of Springhurst ..	J. D. Read ..	Jersey ..	4,892	5·36	260·29	Brighton Cub
115	Belle 2nd of Ellerslie ..	G. Gange ..	Ayrshire	5,888	4·42	260·19	Lelia's Jamie of Ellerslie
116	Ashlyn 85th	J. T. Tweddle ..	Friesian	7,166	3·62	259·56	Royal King Champion
117	Lady Patty of Ferndale	W. M. Vale ..	Jersey ..	5,078	5·10	259·04	Lord Grey
118	Victoria Dutch Belle ..	Department of Agriculture	Friesian	6,956	3·72	258·74	Dominion Domino's Dutch Boy
119	Winnie of Ben Kell ..	R. Ralston ..	Ayrshire	5,915	4·37	258·58	Marvel of Willowvale
120	Morocco's Pansy of Staghorn	F. Bidgood ..	Jersey ..	4,710	5·49	258·57	Morocco's Bound
121	Beauty 5th of Somerville	J. Hutchinson ..	" ..	6,092	4·24	258·22	Daphne's Prince
122	Peerless 18th of Melrose	W. Woodmason ..	" ..	4,641	5·55	257·94	Golden Fern's Viscount
123	Mayflower of Sparrovale	Geelong Harbor Trust	Ayrshire	5,731	4·50	257·76	Jamie of Sparrovale
124	Olive of Rosedale ..	E. Payne ..	" ..	6,768	3·81	257·69	Advance of Golden Vein
125	Rosemary of Springhurst	J. D. Read ..	Jersey ..	5,131	5·01	257·20	Petain
126	Sophie of Burnside ..	J. H. Rogers ..	Ayrshire	6,451	3·97	256·00	Gregor of Oakbank
127	Floss of Tuerong ..	A. W. Findlay ..	Jersey ..	4,835	5·29	255·70	Quality 6th's Son of Melrose
128	Petals Audrey of Elouera	J. Scott	" ..	4,718	5·40	254·71	Audrey's Lord Twylish
129	Mayflower of Banyule ..	Lyon and Kerr ..	" ..	4,729	5·38	254·41	May Boy of Banyule
130	Dorrie of Evergreen ..	H. S. Gibson ..	Ayrshire	5,612	4·52	253·84	Luminous of Drayton
131	Nora of Sparrovale ..	Geelong Harbor Trust	" ..	5,360	4·73	253·63	Jamie of Sparrovale
132	Tulip of the Valley ..	Mrs. E. M. Lennie ..	Jersey ..	5,657	4·47	253·15	Butter Lad of Bonshaw
133	Roma of La Motte ..	S. A. Johnson ..	Ayrshire	5,539	4·39	253·05	Stuart of Gowrie Park
134	Bluebell of Strathbow ..	F. Raggatt ..	Jersey ..	4,865	5·19	252·64	Mac of Tarnpirr
135	Queen's Princess of Clover Flat	F. Raggatt ..	" ..	5,458	4·63	252·50	Prince of Noreen
136	Messo of Banyule ..	Lyon and Kerr ..	" ..	4,861	5·19	252·37	Audrey's Lord Twylish
137	Marjorie of Medburn Grove	C. Bamford ..	" ..	5,809	4·34	251·98	St. Elfred of Willowvale
138	Lady of Sparrovale ..	Geelong Harbor Trust	Ayrshire	5,350	4·70	251·54	Scottish King of Gowrie Park

HEIFERS.—175 LBS. STANDARD.—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
139	La Marseillaise ..	Department of Agriculture	Red Poll	5,747	4·37	251·28	Longford Major
140	Adella's Pet of Inverleigh	A. H. Schier ..	Ayrshire	5,702	4·39	250·27	Major of Gowrie Park
141	Narcissus	Department of Agriculture	Friesian	6,751	3·70	249·60	Dominion Domino's Dutch Boy
142	Graceful Duchess 20th of Melrose	W. Woodmason ..	Jersey ..	4,045	6·16	249·05	Golden Fern's Viscount
143	Daisy 2nd of Fern Tree Vale	A. L. Walter ..	,, ..	4,936	5·04	248·83	Jessie's Boy of Melrose
144	Jeanette of La Motte ..	S. A. Johnson ..	Ayrshire	5,652	4·39	247·88	Malster of Seafield
145	Mulberry 2nd of Ayrbrae	L. McFarlane ..	,, ..	6,039	4·10	247·83	Jock of Gowan Bank
146	Lily 3rd of Fern Tree Vale	W. M. Vale ..	Jersey ..	4,788	5·16	247·41	Pearl's 3rd Audrey Twylish
147	Fuchsia of Springhurst..	J. D. Read ..	,, ..	4,627	5·33	246·69	Attraction of Springhurst
148	Dahlia of Springhurst ..	J. D. Read ..	,, ..	4,209	5·85	246·14	Petain
149	Butterfly of Burnbrae	Sadler Bros. ..	Ayrshire	6,218	3·95	245·91	Bobbie Burns of Burnbrae
150	Trefoil 2nd of Springhurst	J. D. Read ..	Jersey ..	4,561	5·38	245·45	Attraction of Springhurst
151	Adela of Woodstock Grange	H. D. W. Canobio..	Ayrshire	5,883	4·16	244·88	Combine of Glengowrie
152	Gaiety of Burnbrae ..	Sadler Bros. ..	,, ..	5,921	4·13	244·56	Laura's Laird of Gowrie Park
153	Mascotte of Banyule ..	Lyon and Kerr ..	Jersey ..	4,443	5·48	243·45	Audrey's Lord Twylish
154	Ruby of Springfield ..	J. W. Cochrane ..	Ayrshire	5,895	4·12	242·89	Beauty's Majestic of Gleneira
155	Bolobek Jessie ..	O. J. Syme ..	Friesian	6,536	3·71	242·70	Rhoda Prince of Rubicon
156	Victoria Dutch Maid ..	Department of Agriculture	,, ..	6,054	4·01	242·49	Dominion Domino's Dutch Boy
157	Lady Em of Evergreen	H. S. Gibson ..	Ayrshire	6,370	3·80	242·49	General Gordon
158	Modesty of Cathcart ..	W. J. McKernan ..	,, ..	5,205	4·65	242·24	Levendo of Glencairn
159	Lassie of Ayrbrae ..	L. McFarlane ..	,, ..	5,797	4·18	242·08	Harmonist of Ellerslie
160	Audrey's Victress of Somerville	J. Hutchinson .	Jersey ..	4,585	5·25	241·79	Daphne's Prince
161	Jenny Lind 16th of Melrose	E. A. Denis ..	,, ..	3,822	6·31	241·21	Golden Fern's Viscount
162	Pearl Queen of Wethersdane	A. H. Schier ..	Ayrshire	6,047	3·99	241·16	His Majesty of Wethersdane
163	Banksia	Department of Agriculture	Red Poll	5,308	4·54	241·02	Belligerent
164	Prue 2nd of Carracoorte	W. Henderson ..	Ayrshire	5,257	4·58	240·94	Lord Dudley of Gowrie Park
165	Mabel of Riverside ..	J. H. Rogers ..	,, ..	5,773	4·16	240·02	Warlock of Fernhill
166	Tottie of Warrook ..	W. C. Greaves ..	,, ..	5,264	4·55	239·56	Triumph of Warrook
167	Bright Stockings of Warenda	O. Cutler.. ..	Jersey ..	4,470	5·32	237·74	Brighton Cub
168	Corona	Department of Agriculture	Red Poll	5,463	4·34	237·21	Nicotine
169	Radiant of Lochenden	W. J. McKernan ..	Ayrshire	4,910	4·83	237·05	Honesty of Ellerslie
170	Boronia of Woodstock Grange	H. D. W. Canobio..	,, ..	5,007	4·69	235·06	Combine of Glengowrie
171	Mayflower 2nd of Carracoorte	W. Henderson ..	,, ..	5,455	4·31	234·84	Lord Dudley of Gowrie Park
172	Morven Duchess of Brunswick 3rd	Kerr Bros. ..	Shorthorn	6,089	3·84	233·87	Manor York Rose 10th
173	Pet of Hillcrest ..	F. Sadler.. ..	,, ..	5,016	4·66	233·44	Morven Charming Duke 6th
174	Heroine 2nd of Springvale	R. C. Campbell ..	Jersey ..	4,491	5·15	231·36	Doreen's Chief
175	Bolobek Diana ..	O. J. Syme ..	Friesian	6,515	3·55	231·01	Johanna Lad
176	Laura of Dunachton ..	R. Hall	Ayrshire	5,618	4·11	230·65	Adela's Jamie of Raith
177	Starbright of Roxburgh	T. Douglas ..	,, ..	5,180	4·45	230·28	Good Lad of Roxburgh
178	Duchess of Hillcrest ..	M. and W. A. Francis	,, ..	4,759	4·83	230·08	Prince of Mapleton
179	Nellie of Cragneill ..	A. W. Jones ..	Friesian	6,276	3·66	229·74	King Mercena
180	Pansy 3rd of Riccarton	J. A. Lang ..	Ayrshire	5,850	3·75	229·49	White Prince of Gleneira
181	Ada of Roseleigh ..	G. Gange ..	,, ..	5,348	4·29	229·47	Burleigh of Gowrie Park
182	Jubilee Wattle ..	Miss B. Reid ..	Jersey ..	4,643	4·93	229·12	Jubilee Fox
183	Milkmaid of Staghorn ..	F. Bidgood ..	,, ..	4,089	5·60	229·01	Favourite's Noble of Kyora
184	Rye Cake	C. D. Lloyd ..	,, ..	3,673	6·23	228·78	Cream Chief of Glen Iris
185	Joans de Kol of Brundee	J. T. Tweddle ..	Friesian	8,113	2·81	228·16	Fanny's King of Rock
186	Bolobek Ida	O. J. Syme ..	,, ..	6,774	3·35	226·76	Rhoda Prince of Rubicon
187	White Bell of Rochdale	E. J. Moore ..	Jersey	4,719	4·78	225·67	May's King of Rochdale
188	Tabitha 2nd of Riccarton	J. A. Lang ..	Ayrshire	5,493	4·09	224·68	White Prince of Gleneira
189	Lady Grey 14th of St. Albans	H. Luxton ..	Jersey ..	4,445	5·05	224·52	Brighton King 8th
190	Cis of Riccarton ..	J. A. Lang ..	Ayrshire	5,581	4·02	224·18	Royal King of Glenavon
191	Peggy of Woolamai Park	G. A. Kent ..	,, ..	5,256	4·26	224·07	Prince of Mapleton
192	Fox's Fairy	F. Bidgood ..	Jersey	4,006	5·58	223·50	Daisy's Fox
193	Handsome of Lesterfield	A. Jackson ..	,, ..	4,728	4·73	223·46	Quality 6th's Son of Melrose
194	Noorat Cherry ..	Mrs. A. Black ..	,, ..	4,260	5·24	223·15	Milklad of Banyule

HEIFERS—175 LBS. STANDARD—*continued.*

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
195	Modesty of Inverleigh	A. H. Schier ..	Ayrshire	4,961	4·49	222·80	Major of Gowrie Park
196	Sparkle 2nd of Carracoorte	W. Henderson ..	,, ..	5,286	4·21	222·48	Lord Dudley of Gowrie Park
197	Lady Bell of Invergordon	C. G. Newton ..	,, ..	4,968	4·48	222·47	Cocky Rab of Gleneira
198	Primrose of Ayrbrae ..	L. McFarlane ..	,, ..	5,252	4·32	222·26	Harmonist of Ellerslie
199	Pearline of Medburn Grove	C. Bamford ..	,, ..	5,309	4·18	222·15	St. Elfred of Willowvale
200	Filpall 3rd of Carracoorte	W. Henderson ..	,, ..	5,154	4·30	221·75	Lord Dudley of Gowrie Park
201	Morven Myrtle 6th ..	Kerr Bros. ..	Shorthorn	5,681	3·90	221·41	Morven York Rose 15th
202	Syringa of Springhurst	J. D. Read ..	Jersey	3,720	5·95	221·19	Brighton Cub
203	Jessie de Kol Kroons ..	J. T. Tweddle ..	Friesian	5,763	3·84	221·15	Dominion Domino's Dutch Boy
204	Snowdrop of Inverleigh	A. H. Schier ..	Ayrshire	5,179	4·26	220·76	Major of Gowrie Park
205	Lollie of Carracoorte ..	W. Henderson ..	,, ..	5,362	4·11	220·15	Lord Dudley of Gowrie Park
206	Pert Lass of Woodbyrne	J. Benallack ..	,, ..	5,555	3·94	219·86	Bailee of Oakbank
207	Linda of Tuerong ..	A. W. Findlay ..	Jersey ..	4,979	4·39	218·59	Bonnie Lad of Kingsvale
208	Moss Rose 8th ..	F. Sadler.. ..	Shorthorn	4,844	4·51	218·51	43rd Earl of Pentland
209	Boltonia of Springhurst	J. D. Read ..	Jersey ..	4,405	4·94	218·18	Attraction of Springhurst
210	Peggy 2nd of Riccarton	J. A. Lang ..	Ayrshire	5,254	4·14	217·51	Royal Prince of Glenavon
211	Gertie 4th of Carracoorte	W. Henderson ..	,, ..	4,541	4·79	217·37	Lord Dudley of Gowrie Park
212	Springfield White Posch	Flack and Sewell ..	Friesian	5,503	3·94	216·99	Rosevale Inka Sylvia Posch
213	Floss 4th of Carracoorte	W. Henderson ..	Ayrshire	5,185	4·18	216·89	Lord Dudley of Gowrie Park
214	Countess 2nd of Ashby	Dickinson Bros. ..	Friesian	5,644	3·84	216·83	Bolobek General
215	Emily 2nd of Riccarton	J. A. Lang ..	Ayrshire	5,124	4·22	216·11	White Prince of Gleneira
216	Pet of Riverside ..	J. H. Rogers ..	,, ..	4,829	4·45	214·76	Ian of Gowrie Park
217	Parrot of Glenwood ..	W. Tendeson ..	Jersey ..	4,035	5·28	212·94	Carrie's 5th Noble of Melrose
218	Madge of Holly Green ..	C. Lees	Ayrshire	4.035	4·55	212·77	Maxwell of Gleneira
219	Stella of Glen Alvie ..	F. McIver ..	,, ..	4,738	4·49	212·77	Donald of Wothersdane
220	Pentland's Bloom 3rd ..	R. Lidgett	Shorthorn	5,264	4·02	211·93	Duke of Holm Point
221	Promise of Woodbyrne	J. Benallack ..	Ayrshire	5,241	4·04	211·90	Bailee of Oakbank
222	Briar Rose of Hillcrest	W. M. Vale ..	Jersey ..	4,727	4·47	211·43	Bell Boy of Hillcrest
223	Buttercup 2nd of Carracoorte	W. Henderson ..	Ayrshire	4,316	4·90	211·41	Lord Dudley of Gowrie Park
224	Fairy Bell of Rochdale..	E. J. Moore ..	Jersey ..	4,246	4·97	211·10	May's King of Rochdale
225	Duchess of Lochenden	W. J. McKernan ..	Ayrshire	5,159	4·09	210·77	Harry of Golden Vein
226	Bellona's Queen of Carracoorte	W. Henderson ..	,, ..	4,500	4·67	210·09	Lord Dudley of Gowrie Park
227	Graceful Countess 2nd of Lesterfield	A. Jackson ..	Jersey ..	3,706	5·67	210·09	Quality 6th's Son of Melrose
228	Waituki Princess Adelaide	A. W. Jones ..	Friesian	5,759	3·63	209·55	Royal Prince Pietertje de Kol
229	Bloomer of Medburn Grove	C. Bamford ..	Ayrshire	5,273	3·96	208·83	St. Elfred of Willowvale
230	Waituki Princess Amy	A. W. Jones ..	Friesian	6,777	3·07	208·38	Royal Prince Pietertje de Kol
231	Brunette of Willowvale	R. Ralston ..	Ayrshire	4,731	4·40	208·08	Gain of Oakbank
232	Bonnie Jean of Invergordon	C. G. Newton ..	,, ..	4,901	4·24	207·71	Cocky Rab of Gleneira
233	Mimulus 2nd of Springhurst	J. D. Read ..	Jersey ..	3,682	5·62	206·94	Petain
234	Pattie of Hillcrest ..	G. Rowe ..	,, ..	4,192	4·92	206·70	Bell Boy of Hillcrest
235	Dainty Maid of Ben Keil	R. Ralston ..	Ayrshire	4,885	4·08	206·64	Marvel of Willowvale
236	Marcella of Inverleigh ..	H. Perdriau ..	,, ..	5,026	4·11	206·33	Jamie of Inverleigh
237	Katinka	G. A. Waite ..	Friesian	6,537	3·15	206·23	Count Togo
238	Ursula of Burnside ..	L. F. Armstrong ..	Ayrshire	4,260	4·82	205·42	Gregor of Oakbank
239	Peeress of Ben Keil ..	R. Ralston ..	,, ..	4,965	4·13	205·07	Desmond of Ben Keil
240	Tundra	Department of Agriculture	Red Poll	4,394	4·61	203·90	Belligerent
241	Jubilee Tecoma ..	Miss B. Reid ..	Jersey ..	4,425	4·59	203·18	Twylish Maderia's Fox 2nd
242	Myrtle of Colac ..	C. Falkenberg ..	,, ..	3,692	5·50	202·94	Twylish Queen's Fox
243	Brownie 4th of Carracoorte	W. Henderson ..	Ayrshire	4,455	4·54	202·28	Dahlia's Duke of Gleneira
244	Colony	Department of Agriculture	Red Poll	4,464	4·52	201·78	Belligerent
245	Lady Jar 4th of Gleneira	F. McIvor ..	Ayrshire	5,038	4·00	201·18	Jock of Gowan Bank
246	Flower of Roseleigh ..	N. Gange ..	,, ..	4,812	4·16	200·50	Baron of Roseleigh
247	Gladden of La Trobe ..	C. G. Newton ..	,, ..	4,575	4·38	200·42	Darnley of Gowrie Park
248	Rita of Inverleigh ..	A. H. Schier ..	,, ..	5,111	3·91	200·07	Levendo of Glencairn
249	Bertha of Ben Keil ..	R. Ralston ..	,, ..	5,113	3·91	199·97	Desmond of Ben Keil
250	Trixie of Warrook ..	Cockbill and Gibbs	,, ..	4,507	4·43	199·63	Triumph of Warrook
251	Phyllis of Dunachton ..	R. Hall	,, ..	4,702	4·24	199·58	Laurie of Dunachton
252	Gladwyn of La Trobe ..	Sale High School ..	,, ..	4,053	4·92	199·22	Darnley of Gowrie Park
253	Milk-kiss of Inverleigh	A. H. Schier ..	,, ..	4,903	4·06	199·11	Major of Gowrie Park
254	Daisy 2nd of Ferndale ..	D. C. Miller ..	Jersey ..	3,638	5·45	198·47	Lord Grey
255	Minnie of Riccarton ..	W. T. Cullen ..	Ayrshire	4,471	4·43	198·15	Lanius of Willowvale

HEIFERS—175 LBS. STANDARD—*continued*,

Order of Merit.	Name.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Sire.
				lbs.		lbs.	
256	Dainty's Clementine of Kelburn	Mrs. I. Beard ..	Jersey ..	4,425	4·06	197·48	Music 3rd
257	Countess of Raith ..	Leslie and Gerrand	Ayrshire	4,969	3·96	196·99	Adela's Jamie of Raith
258	Craigneil Witch ..	A. W. Jones ..	Friesian	5,825	3·37	196·60	Medbury King
259	Rose of Medburn Grove	C. Bamford ..	Ayrshire	4,426	4·44	196·39	St. Elfred of Willowvale
260	Filpail 4th of Carracoorte	W. Henderson ..	"	4,764	4·11	195·72	Lord Dudley of Gowrie Park
261	Moel of Langley Park ..	Callery Bros. ..	" ..	4,528	4·31	195·43	Plawaway of Willowvale
262	Daisy of Colac ..	C. Falkenberg ..	Jersey ..	3,355	5·82	195·21	Twylish Queen's Fox
263	Blanche of Glen Alvie ..	H. Perdriau ..	Ayrshire	5,335	3·62	194·23	Donald of Wethersdane
264	Noreen of Golden Vein	W. McIvor ..	" ..	4,578	4·21	192·57	Earl of Golden Vein
265	Charity of Raith ..	Leslie and Gerrand	"	4,684	4·08	191·23	Adella's Jamie of Raith
266	Agnes of Holly Green ..	H. L. Webb ..	" ..	4,873	3·87	188·68	Maxwell of Gleneira
267	Margaret's Fancy of Somerset	A. E. Batson ..	Jersey ..	3,584	5·26	188·63	Admiral
268	Ideal of Ben Kell ..	R. Ralston ..	Ayrshire	4,866	3·87	188·50	Marvel of Willowvale
269	Walulu Abbekerk Artis of Corfield	Flack and Sewell ..	Friesian	5,278	3·28	188·14	De Kol Artis Rooker
270	Nyasa	Department of Agriculture	Red Poll	3,834	4·90	187·85	Belligerent
271	Tulip of Burnbrae ..	Sadler Bros. ..	Ayrshire	4,269	4·38	186·82	Bonnie King of Gowrie Park
272	Fine Quality of Inverleigh	A. H. Schier ..	" ..	4,025	4·63	186·58	Kia Ora of Haydowns
273	Prudence of Roxburgh	A. H. Schier ..	" ..	5,354	3·48	186·47	Good Lad of Roxburgh
274	Oatlands Nancy ..	J. Thorburn ..	" ..	4,588	4·03	184·94	Maister of Seafield
275	Olive Berry of Glenbrae	M. and W. A. Francis	" ..	4,323	4·26	184·03	Warlock of Fernhill
276	Noorat Deception ..	Mrs. A. Black ..	Jersey ..	3,714	4·95	183·84	Milklad of Banyule
277	Fancy of Fairview ..	A. E. Haughton ..	" ..	3,571	5·12	182·94	Jolly Mike
278	Good Luck of Glenora ..	Cockbill and Gibbs	Ayrshire	4,353	4·20	182·92	Good Lad of Roxburgh
279	Laura 4th of Carracoorte	W. Henderson ..	" ..	3,998	4·57	182·55	Lord Dudley of Gowrie Park
280	Lustre of Riccarton ..	W. T. Cullen ..	" ..	4,418	4·12	182·14	Lanius of Willowvale
281	Rocket of Ruhbank ..	Miss L. Robinson ..	Jersey ..	3,220	5·64	181·59	Kyora's Lotina's Financial King
282	Jessemia 13th of Kingsvale	F. W. Biescher ..	" ..	3,506	5·16	180·93	Bonnie Lad of Kingsvale
283	Silvermine of Elouera ..	J. Scott	" ..	2,705	6·66	180·35	Lord Silvermine 8th of Banyule
284	Flower of Raith ..	Leslie and Gerrand	Ayrshire	4,254	4·22	179·46	Adela's Jamie of Raith
285	Daffodil 2nd of Jerseyvale	Mrs. L. Orchard ..	Jersey ..	3,532	5·08	179·31	Golden Twylish
286	Morven Duchess of Brunswick 2nd	Kerr Bros. ..	Shorthorn	4,703	3·80	178·73	Manor York Rose 10th
287	Dairy Lass of Carracoorte	W. Henderson ..	Ayrshire	4,294	4·15	178·14	Lord Dudley of Gowrie Park
288	Lily of Jersey Vale ..	Mrs. L. Orchard ..	Jersey ..	3,735	4·76	177·91	Golden Twylish
289	Cinderella of Burnbrae	Sadler Bros. ..	Ayrshire	5,211	3·41	177·60	Bonnie King of Gowrie Park
290	Stella of Riccarton ..	W. T. Cullen ..	" ..	3,927	4·51	177·25	Lanius of Willowvale
291	Violet 9th of Rocklee ..	Mrs. F. M. Akehurst	Jersey ..	3,103	5·71	177·23	Carnation's Fancy Northwood King
292	Purity 5th of Melrose ..	W. Woodmason ..	" ..	2,982	5·93	176·98	Golden Fern's Viscount
293	Jessamine of Springhurst	J. D. Read ..	" ..	3,403	5·19	176·66	Brighton Cub
294	Morven Duchess of Brunswick 19th	Kerr Bros. ..	Shorthorn	4,605	3·83	176·20	Charming Duke

IMPACTION PARALYSIS OF CATTLE.

By H. R. Seddon, D.V.Sc., Veterinary Institute, University of Melbourne.

Symptoms and Possible Causes.

The disease condition of cattle known as Impaction Paralysis has existed in Victoria for a number of years, but until recent investigations were made the actual cause remained obscure.

It was pointed out long ago that the term "Impaction Paralysis" was really a misnomer. Paralysis there certainly is, a paralytic condition of the throat being the chief symptom seen in acute cases; while impaction of the food in the stomachs and bowels also occurs. Such an impaction, or perhaps more correctly, a *stagnation* of the food in the alimentary canal, however, is the effect and not the cause of the paralysis.

This paralysis affects not only the muscles used in eating and swallowing food, but also the muscles of the paunch (and other stomachs) and the bowels. Thus, food swallowed before the animal develops the throat paralysis is not passed on through the bowels, nor is it re-masticated, but simply remains where it is; the animal does not "chew the cud." Though the sick animal requires water to refresh the tissues of the body, it is unable to get it by drinking, as it is unable to swallow, and in consequence the body withdraws all it can from the food in the bowels. The tendency is, therefore, for such food to appear unduly dry, and such an appearance is usually exaggerated by the fact that the food when eaten was very dry, the disease occurring chiefly when the grass is dried up and rather innutritious.

Thus we see that, as pointed out, first by Dr. S. S. Cameron (now Director of Agriculture, but then Chief Veterinary Officer), the apparent impaction is the *result* and not the *cause* of the disease. What then brings about the paralysis? Recent investigations conducted at the University Veterinary Institute have led to the isolation of a bacterium, apparently new to science, which it is believed is the cause of the disease. This microbe (a rod-shaped germ or bacillus) produces a very powerful toxin, and administration of this toxin (or bacterial poison) causes paralytic symptoms identical with those met in Impaction Paralysis. Thus, the animal is seen to gather food only with great difficulty, to slobber, and to present a general drowsy appearance. Later it can neither eat nor drink, and becomes unsteady in its walk; finally it goes down, is unable to rise, and ultimately dies.

Though the cause has been elucidated it remains to be determined how and when this toxin is developed; in other words, how animals contract the disease.

A similar disease occurs in South Africa, and investigations there have led to the similar conclusion, that it is due to a toxin produced by bacteria, but the actual bacterium has not yet been identified. It has been found, however, that such a toxin is present in the decomposing carcases of animals that have died of the disease, and also in the carcases of animals dying from other causes on infected properties. Further, it has been demonstrated that this toxin is present also in the bones of such carcases. From the fact that the "bone-chewing habit" is so prevalent amongst animals suffering from the disease, it is believed

in South Africa that cattle contract it by chewing bones. The chewing of bones is there looked upon as being caused by depasturing cattle on soils possibly deficient in certain chemical constituents. The paralytic condition, therefore, is considered to originate from two causal factors:—(1) The habit of chewing bones, and (2) the presence of the toxin in the bones chewed.

The particular bacterium isolated here in Australia was obtained from a bone of an animal that had died of the disease, and hence it would seem that the disease might be contracted by chewing bones, as is suggested by these South African investigations.

It is doubtful, however, whether this craving for bones should always be looked upon as due to a deficiency in the food; indeed, some consider that at times it may be nothing more than a habit, induced often through idleness. Nevertheless, owing to the danger of animals picking up infected bones, such a habit should be prevented if possible. It is a well-known fact that it can be prevented in very large measure by supplying animals with suitable licks, and such should, therefore, be provided. Further, bones of all carcasses should be destroyed, by burning if possible. This is not always feasible owing to the absence of timber, or again the dry state of the grass may render it highly dangerous owing to the risk of the fire spreading. In such cases, however, it should be remembered that carcases may be a source of danger, and they should be destroyed as early as possible. It may be mentioned that on several occasions lately cases have been traced to animals gaining access to local "cemeteries"—situations to which owners have thoughtfully dragged carcases to await the autumn rains, so that in burning them there would be no risk of starting a bush fire, and where they remained forgotten when the rains have come.

Attention to these two factors (destruction of bones and the provision of licks—recommended by the Agricultural Department as "good animal husbandry") has no doubt been responsible for the great diminution in the number of cases of Impaction Paralysis in Victoria during recent years.

Whilst we know that bones may be a grave source of danger, it is not possible to state that cases of Impaction Paralysis are due *always* to the eating of bones. At times there have occurred cases wherein it would appear that there might be some other method of infection, and the help of stock-owners is therefore sought in order that this phase of the problem may be investigated. The discovery of cases, wherein the possibility of animals having contracted the disease by chewing bones can be eliminated, is not as easy as it would seem. Especially is that so on large properties, for a few stray bones lying about may easily be overlooked. Further, the bones need not necessarily be *cattle* bones, for there is reason to believe that the toxin might be produced in *any* putrefying carcase, and here there seems to be support for an old theory that the disease might be contracted by animals eating the carcases of poisoned rabbits. In such a case, however, the poison causing the Impaction Paralysis would not be the poison which led to the death of the rabbit, but a poison (toxin) produced by the growth of certain bacteria in the decomposing carcase of the rabbit.

As evidence of the fact that bones of other animals than cattle may contain the toxin, and so cause the disease, the following may be quoted:—Over eighteen months ago an outbreak of what appears to

have been the same disease occurred in Western Australia, and it was noted on *post-mortem* examination that some sheep bones were present in the paunch of the cattle affected. These bones were evidently from the carcases of sheep that had died of an unknown complaint six months previously. In June of this year some bones were, at my request, secured from these sheep carcases, and though they had lain on the ground for over two years and were well leached, examination showed one of them to contain a toxin-forming micro-organism, apparently identical with that found in other bones here.

It is unlikely that the sheep died of Impaction Paralysis, as such animals are not given to chewing bones. The probability is that they merely provided a breeding ground for the microbe which flourished in their carcases, and so led to the bones of the sheep becoming toxic.

It may be wondered how it is that carcases of animals that have died of other diseases can contain the toxin. There are two possible explanations. The first is that flies may carry the causative microbe from an infected decomposing carcase to an otherwise healthy one. The second is that, as the microbe may remain in the soil on infected properties in much the same manner as do similar germs in the case of Anthrax and Blackleg, it is possible that an animal may pick up the microbe with the feed as it grazes. It is not certain whether microbes picked up under such circumstances can cause the disease, for they may be harmless whilst remaining in the intestine. If, however, that animal with the microbes in its bowels dies, from any cause whatever, such microbes might, after the death of the animal, invade the carcase, even the bones, and then and there produce their toxin.

Similarly, one cannot state that *all* decomposing carcases contain the toxin (in fact, on several occasions I have been unable to find it present), but as neither carcases nor bones containing the toxin differ in outward appearance from what one may call harmless carcases or bones, it is advisable to *treat all with suspicion* and to accomplish their destruction.

Treatment.

Prevention of the disease having been discussed, it now remains only to consider treatment, and the old adage "prevention is better than cure" holds here. The nature of the microbe and its toxin does not hold out any hope of a vaccine or anti-toxin being of any very great service as a cure. The toxin which causes the paralysis is quickly absorbed from the bowels and becomes fixed in the brain stem, and when in that condition cannot be satisfactorily combated by any known method of treatment.

In the early stages, whilst the animal is still able to swallow, a purgative drench removes toxin still present in the bowel, but, as the toxin is generally absorbed into the system some time before symptoms are manifested, such treatment cannot be expected to effect a cure in all cases. Suitable medical treatment by a qualified veterinary surgeon, and, above all, the provision of liquid or sloppy food (milk, &c.) as long as the animal is able to take it, helps an animal to sustain an attack. Great care must be taken in drenching, as once the paralysis of the throat occurs the medicine instead of being swallowed is liable to "go down the wrong way," entering the wind-pipe, and causing death suddenly from choking or later from pneumonia.

Conclusion.

From the above it will be seen how important it is that the possible avenues of infection should be definitely ascertained, in order that all possible preventive measures may be taken, and to that end further experiments are being undertaken at the University Veterinary Institute. The co-operation of the stock-owner is also required, and particulars of any cases where it seems impossible that the animals contracted the disease from chewing bones or other portions of decomposing carcases would be most welcome.

As many cases may be noticed on properties a considerable distance from Melbourne, and it may not be possible for me to inspect them personally at the moment, it is requested that particulars of such be sent to the Chief Veterinary Inspector, who has courteously promised to conduct, through his staff, the necessary preliminary investigations.

It is especially desired that such cases should be notified immediately they are noticed, as investigations then would offer the greatest chance of success.

FOUNDING A PIG HERD.

By R. T. McKenzie, Senior Dairy Supervisor.

Pig breeding still maintains its place as an exceedingly profitable adjunct to dairy farming. The fecundity of the pig is astonishing, and it is without question the most economical farm animal.

It has been estimated that the natural increase among cattle is about 80 per cent., sheep 100 per cent., and pigs 1,500 per cent. per year. It has long been established that pigs produce more edible meat from a given quantity of food than any other farm animal. While it requires 13 lbs. of dry matter in the form of feed to secure a gain of 1 lb. of beef in cattle, 8 lbs. of food for a gain of 1 lb. of mutton, in the pig 4 or 5 lbs. of grain will produce 1 lb. of pork.

When killed, sheep dress about 60 per cent. dead weight, cattle 65 per cent., pigs 80 per cent.

The carcase proportion of edible meat to bone in the pig is much greater than in the case of either sheep or cattle. In the process of developing a pig herd it is undoubtedly preferable to commence with a pure breed. The particular breed best suited to local conditions can be determined by the breed common in the locality and market demands. The Berkshire and Middle Yorkshire appear to be the most favoured in this state, but the Large York has proved best for bacon and pork production and a boar of this breed should be used even on sows of others breeds. The Large Boar matures early and gives a greater proportion of lean meats than most other breeds. Some farmers who keep but few pigs and raise only a few litters seem to think that it is not worth the trouble to insure that those few should be pure breds. It is contended that in the market it makes little difference in the price whether the animal is a pure bred or otherwise. That may be so, but the vital point overlooked is that it takes the "scrubber" and the grade pig a longer time to gain a given weight than it does the pure bred, and consequently there is a saving in time, labour, and feed. It costs very little more to establish a pure bred herd; in fact, the only additional expense is the difference

in the cost of the foundation herd. Equipping the piggery, labour and attention will be the same in both cases, but it is safe to say that the extra return from the pure breds as against a mongrel herd would wipe out that additional cost in the first couple of years.

Selecting the Sow.

There are many points to be considered in selecting a brood sow. Where it is convenient, the best plan is to choose the sow at the owner's farm, so that she can be seen in her usual habitat and condition. As fecundity is hereditary, it is important to find out her family history; the prolificacy of her dam and great dam on both sides of the pedigree. She should be fairly big and roomy, showing signs of good constitution, with at least twelve fully developed teats of good size, placed well apart, with the front teats well forward on the body. An equable temper is desirable, a bad-tempered sow rarely makes a good mother, while the progeny are sometimes so irritable in the fattening pens that they will not allow any other pigs with them to eat, rest, or sleep. Contentment is a sure sign of health and constitution. The sow which makes the best mother is contented, and after she has satisfied her appetite will lie down contentedly and suckle her young.

There are other desirable qualifications in her conformation, such as well-sprung ribs, arching back from the vertebræ, giving a flat, straight side, well finished rump and hams, legs of medium length well set apart, pasterns upright, so that the animal walks on its toes. Plenty of straight silky hair.

Selecting the Boar.

It is advisable when purchasing a boar to go to a breeder who has made a reputation, for he, in order to maintain his good name, can be relied upon to supply a good animal. The boar should have individuality as well as pedigree. Size is not the chief consideration.

It has been found that a very large boar does not last long, he becomes too ponderous for the sows, slow, and his litters few in number. As in the case of the sow, his family history should denote that he comes from parents that beget plentiful litters. It is also essential that he should possess an even temper and not be lethargic.

Temper, like prolificacy, is hereditary, hence its importance in breeding. It is not wise to use the boar too freely until the quality of his progeny can be judged.

Constitution is of vital importance, for any defect in that respect will probably be imprinted in his offspring.

The procreative organs should be well developed, as it denotes constitutional vigour, and his rudimentary teats should be numerous and well developed.

Conformable points such as width of back as well as being level and strong, forelegs well set apart, thickness through heart region, a good coat of hair of fine texture, must also be taken into account.

Breeding.

Both the boar and the sow should be mature before they are mated. From eight to ten months at least. If the sow is used earlier her growth will be checked and seldom become a large vigorous specimen of her breed; moreover, she will most likely breed weakly pigs. Although liberal feeding and attention may to some extent remedy the ill-effects of early

pregnancy and early lactation, it is better to avoid the cause. Similarly in the case of the boar, if he is used too early his growth will be retarded and his sexual activity diminished. For that reason the practice sometimes followed of mating an immature boar with an old sow cannot be commended.

The boar should be kept in a special enclosure and not permitted to run with the sows. During the period of heat the sow can be removed to the boar's sty, and after one complete service removed. If the service is unsuccessful, the sow will return in 21 days. The period of gestation is 4 months.

The pregnant sow should be allowed plenty of exercise. Nature never designed the pig to be kept in confinement, yet it is possibly more than any other domestic animal denied suitable exercise. Proper exercise comes next in importance to food. The increased respiratory activity due to exercise means two or three times more the volume of oxygen passing through the lungs as when the animal is denied exercise. This increased vitality means a larger and stronger muscular system, active liver, better digestion and health.

Generally the sow has no difficulty in farrowing, and should not be interfered with without serious cause. It is better to destroy any weakly pigs at birth. The "runt" is not worth bothering with.

It depends a good deal upon the treatment of the sow during her gestation period whether she produces a good healthy litter with a plentiful supply of milk for them, or a litter of weakly pigs and a small flow of milk. She should be fed on good nutritious food to maintain her own condition and develop the unborn pigs. With rational feeding and exercise prior to parturition it is a rare occurrence that a sow will eat her young. Successful pig rearing depends largely on the piglings starting off well. The first week or two the mother's milk is practically all that is required; for that reason the feeding of the sow must be calculated to maintain a good flow of milk to nourish the litter. If the sow is allowed to get low in condition and health, her milk supply lessens both in quality and quantity, and the litter suffers in consequence. Gradually the little ones may be taught to drink by themselves; the ration should be one easily digested and approximating as nearly as possible to the mother's milk. Skim milk with the addition of a small quantity of fatty food (such as oil cake) to take the place of the fat separated is very suitable.

Improper feeding a few weeks before and after weaning seriously hampers the later development of the pig. As a rule, the little pigs manifest a desire to eat when they are two weeks old. A little grain either crushed or soaked previously can be placed on a clean bottom for them to pick and chew at. It is not always recognised that the pig is as much an herbivorous animal as the horse or the ox. Grass and green stuff are valuable aids to digestion, and should form a part of the ration. It is not a profitable proposition, although it is often followed, to allow the young pigs to become stores. The objective should be to fatten the pig from the time it is born, for it has been found from experience that a young pig has greater digestive power and can assimilate food more easily than an old one; furthermore, the bacon is more valuable, as there is a greater proportion of lean to fat.

Pigs should always have access to a plentiful supply of clean water.

REMINDERS FOR OCTOBER.

LIVE STOCK.

Cattle.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Year-Book of Agriculture, 1905*, page 314. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will.

Sow maize for summer feeding and ensilage, also Japanese millet for grazing during dry summer months. Mow surplus grass for hay. If cut when the grass or trefoils are in bloom, grass hay will be as good fodder as any cerial hay. If top-dressed with phosphatic or farm yard manure, good returns will be obtained from grass hay; it has also the great advantage that mice will not work in it. Cut 1 acre for each cow in the herd; it will keep until the next drought if protected from the weather.

Pigs.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal, or half that amount of mineral phosphate, per 100 lbs live weight in food daily. If pigs are lousy dress them with kerosene emulsion or sulphur and lard, rubbing well into the crevices of skin, and disinfect styes Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Revised edition of Bulletin 16 is now available.

Sheep.—Shear as early as the weather will permit, and avoid the usual excessive dust in travelling to, and yarding at sheds. Burr and seeds also collect on the fleeces if shearing be left until late in the season, particularly with lambs. Shear all lambs intended to be held over—they thrive better and make more growth through the ensuing summer and autumn. Fleeces from well-bred sheep should be skirted with care, the better the class of wool the greater the necessity. From fleeces that have become dry and earthy on the backs, remove only the merest stains; there is little advantage in skirting these. It is better management to have ample table space, and extra hands skirting closely, than to hastily tear off unnecessary wool and then employ men at other tables to sort "broken fleece," "first," and "second" pieces, &c. All stains must be removed from ewes' fleeces, and pizzle stains from the bellies of wethers. Keep separate all coarse fleeces from the finer sorts, and in merinos the yellow and mushy from the shafty and bright. Skirt all hairy thighs from crossbred fleeces. Avoid sending wool to market in long, round-sided bales, known as "sew-downs." Press in a box-press, forming square sides. Brand bales neatly, on one side only, and not with sheep-branding oil, tar, or paint. Stencil plates and branding ink can be obtained on application to the respective brokers.

Poultry.—Incubation should cease this month—late chickens are not profitable. Devote attention to the chickens already hatched; avoid overcrowding. Feed with dry mash. Also add plenty of green food to ration. ordinary feeding to be 2 parts pollard, 1 part bran, and a little animal food after the first fortnight. Feed ground grain, such as wheat, hulled oats, maize. and peas, which should be fed in hopper to avoid waste. Grit or coarse sand should be available at all times. Variety of food is important to growing chicks; insect life aids growth. Remove brooders to new ground as often as possible; tainted ground will retard development.

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Vol. XX. October, 1922. Part 10.

FARMERS' FIELD DAY AT WERRIBEE.

The Annual Field Day at the State Research Farm at Werribee was held on the 29th September, when there was an attendance of about 500 farmers from various parts of the State. It was the eighth field day since the inception of the farm, and at least one of those present had attended each gathering. "I was here first in 1913, when the farm was just started," he said, "and it's a pity some more of us country people couldn't come along, not only to see what is being done, but at the same time to pick up a few useful hints"—a sentiment that later in the day was expressed by both His Excellency the Governor and the Assistant Minister of Agriculture.

The tour of inspection, under the guidance of the Agricultural Superintendent (Mr. A. E. V. Richardson), commenced at the rotation plots, where the value of the various systems of rotation cropping was in most cases observable at a glance.

A visit was made to the stud cereal and cross-bred plots, where Mr. Richardson briefly explained the experiments that are being made and some of the more important recent results. The chief plant-breeding work is with wheat, but some experiments in the raising of oats and barley are also being conducted. Several new varieties of oats appear to be promising—one in particular, a variety much earlier than Algerian, which last year yielded 63 bushels per acre. Tests of new standard varieties of barley and some cross-breds are also being made. The result from the Cape Variety last year was very satisfactory, its yield being 73 bushels to the acre.

At the permanent fertilizer plots the results from the different experiments were given, and samples of crop from several of the plots were exhibited side by side in order to bring home better the results to be expected from the application of various manures and the value in some cases of feeding off.

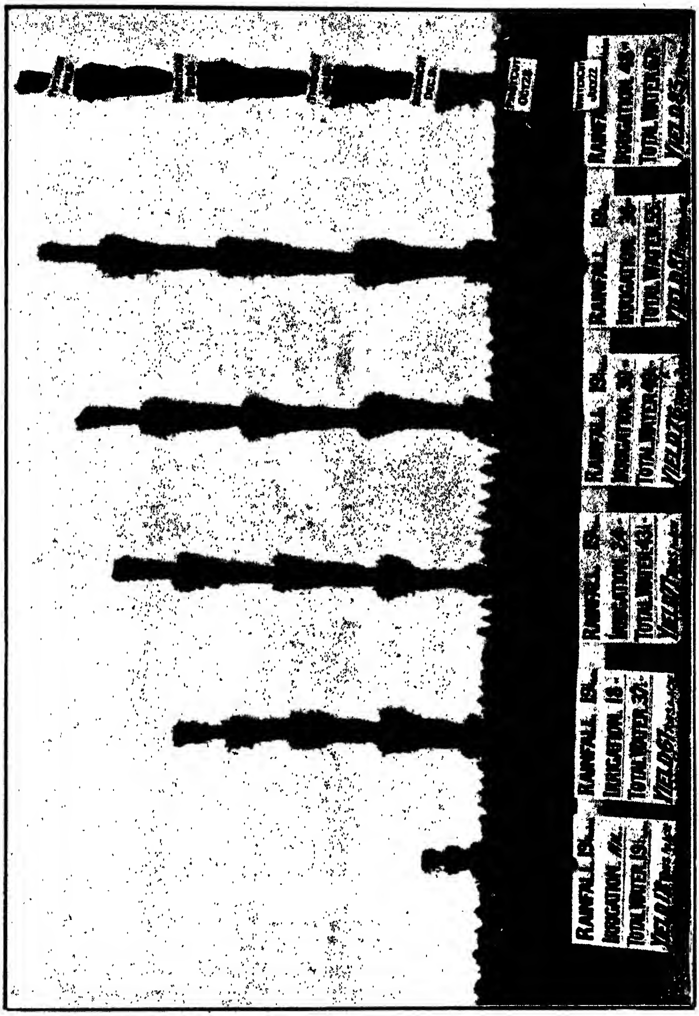
The lucerne field was of great interest to most of the visitors. Here, in addition to experiments to determine the best stage at which to cut lucerne and tests in the effects of different fertilizers and increasing quantities of water, trials are being made with varieties from several parts of the world. Hunter River lucerne has, over the two seasons, given the best yield of hay, being approached only by Italian. Further, during the winter, Hunter River was very prominent, while Italian made but little growth. Grimm and Japanese were also very poor during the winter, but in the summer they produced a leafy hay with fine stems. South African approached most closely to Hunter River in regard to winter growth. It appeared to produce a better quality hay than the latter. French Provence did not make extra good winter growth, but it yielded well during the summer, and gave hay of good quality. Patagonian gave some heavy yields. It appears to grow more slowly than Hunter River.

Demonstration on Effect of Varying Fertilizers on Growth of Wheat and Oats.

The dairy farmers present eyed critically the Red Poll herd, founded by the Department twelve years ago, and from which some 300 young bulls have been sold to farmers throughout the State. The dairy herd of Friesians more recently established was also of great interest. The history of both herds was briefly given by Mr. Wilson, the farm manager. During the afternoon the Border Leicester and Suffolk flocks of the farm came under inspection, as did the Clydesdale stallion Baron Wigton, and a few of the visitors also made a visit to the poultry pens, where there are at present about 1,000 birds.

On the return of the party to the farmstead, afternoon tea was served in one of the barns. At its conclusion the Assistant Minister of Agriculture (Mr. J. W. Pennington, M.L.A.), in extending a welcome to the Earl of Stradbroke, said His Excellency was a practical farmer—unfortunately, his farm was not in Victoria—but he was taking a keen interest in the primary production of the State, which

they all greatly appreciated. He was pleased to see that there was even a larger gathering this year than there was on the last occasion, but at the same time there should have been a larger gathering—(hear,



Lucerne Poles Illustrating Yield of Lucerne Hay from Application of Varying Quantities of Water.

hear)—seeing that there were over 60,000 primary producers in Victoria.

In responding to Mr. Pennington's welcome, His Excellency said he was glad to have the opportunity of meeting farmers of the State,

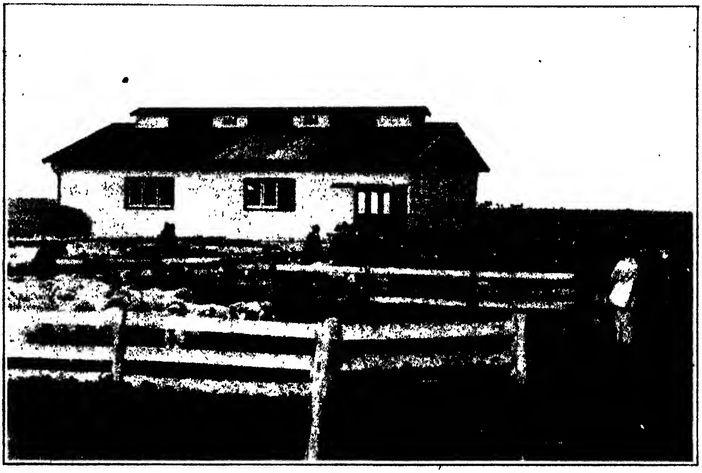
and to find there were so many who were deeply and keenly interested in what was being done on the Research Farm. One was apt, as a farmer, to think more of the practice than of the theory of agriculture, but here they were fortunate in having the two combined, and it must be instructive to all of them to see what had been accomplished on the various experimental blocks and in the breeding of stock.

The great object of all our farmers was to convert into money what was grown on the land. To do that one must study, especially in stock-breeding, early maturing. Here they saw how fat lambs could

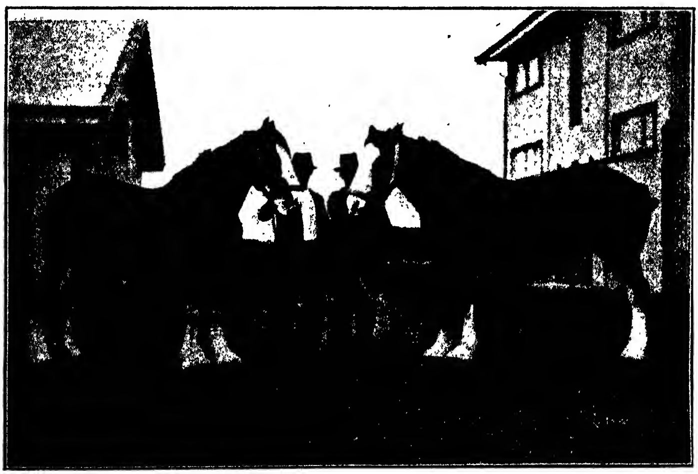
His Excellency the Governor interested in Clydesdales.

be produced—lambs which were selling from 24s. to 25s. He thought it was quite a good proposition for those who could rear fat lambs. They also saw experiments in regard to Red Polled cattle which might be utilized more extensively, especially on closer settlements. The men who kept dairies were seeking to get better results from their milk, and at the same time rear stock which would grow into good butcher's beef. The object of the farm was to show what could be done so as to get returns quickly, and to illustrate what were the most suitable cereals to grow on the available lands. Some of the experi-

ments being conducted on the farm could, perhaps, be carried on in a small way by the farmers themselves in their own district.



Demonstration on Suffolk and Border Leicester Sheep.



Clydesdale Mares.

There was one thing which was not taken up in Victoria, and that was the matter of breeding a good, marketable pig. In the Old Country it was often said that to make a farm pay they must have cows and

sows. Knowing the requirements on the other side of the water, it seemed to him that the pigs grown in Victoria were of too fat a nature. They could test whether this was so, but he strongly advised them to look into the question of obtaining a good market for bacon and ham, and then, having secured it, to maintain that market. If they wanted to go in for bacon and ham they must produce them with less fat, and they would then win the export market.

There was another thing he had noticed going around the estate, and that was the impending shortage of timber. This was an important thing to many of them. (Hear, hear.) They had their fences to maintain, and they also needed fuel. Although the State could do a great deal in the matter of re-afforestation it seemed to him to be an expensive thing to undertake. The planting of trees seemed to be almost a prohibitive proposition from the point of paying, but they should have their holdings planted with trees which would in the future be of great use to them for fencing and fuel. In some parts of the State fuel was an expensive thing to buy, and they must look to the requirements of future generations. They should remember that they wanted to leave things on the farm better than they were before they first took up the land.

In conclusion, he said he hoped these annual gatherings would become better and better attended, and be of interest to all the farming interests throughout the State. (Applause.)

Mr. Pascoe, M.P. (Minister of Agriculture, South Australia), moved a vote of thanks to the Governor for his visit to the farm. Knowing what experimental agriculture meant, he said the fact that an institution of this character was being maintained at a loss of only £1,200 a year reflected great credit upon the management and the Department generally. (Applause.) They had every reason to be proud of what had been accomplished there. They should also be proud that they had in the State Governor a man who was taking an interest in the primary industry of the State. He believed it had been a very distinct advantage that they had had in South Australia during the last few years an "agricultural Governor," especially in regard to dairy cattle, in the person of Sir Archibald Weigall. Where they possessed a Governor with a knowledge of agriculture, who was willing to give his own experience to the people of Victoria, they would find him to be a wonderful asset to the State. (Applause.)

OLD JOURNALS OF AGRICULTURE REQUIRED.

The issues of this *Journal* for the months of September, 1920, and January, February, and August, 1921, are out of print.

As requests for these issues are being received, principally from libraries desirous of completing their sets, we would be grateful if any of our readers possessing copies for which they have no further use, would post them to the Department of Agriculture. Postage will be paid by the Department.

CODLIN MOTH EXPERIMENTS.

Owing to the prevalence of codlin moth during the season 1920-21, the Department of Agriculture decided to conduct experiments to determine the efficacy of the sprays generally used for this purpose.

Those experiments were carried out in the following districts:—

Mr. Butuch's orchard, Harcourt, under the supervision of Mr. S. A. Cock.

Mr. H. L. Tompkins' orchard, Kilsyth, under the supervision of Mr. J. Farrell.

Messrs. Swan Bros.' orchard, Londrigans, under the supervision of Mr. C. F. Cole.

Messrs. Stockton Bros.' orchard, Hastings, under the supervision of Mr. R. Wadeson.

Messrs. Stockton Bros.' orchard, Kyabram, under the supervision of Mr. W. Nicholls.

Mr. Hugh Darker's orchard, Amphitheatre, under the supervision of Mr. W. Chalmers.

Mr. Hugh Darker's orchard, Diamond Creek, under the supervision of Mr. G. Fletcher.

The growers who placed the plots at the disposal of the Department for the experiments, and rendered such valuable assistance to the supervisors while they were being conducted, deserve, not only the thanks of the Department, but also of the fruit-growers of the State. It will be seen that, to ascertain as far as possible the value of each spray, each of the different groups of trees in the experiments had one spray omitted. The result showed that, next to not spraying at all, on the average the omission of the calyx spray was responsible for the worst crops.

As might have been expected, there are variations in the results that cannot be explained; in the case of the Howell pear groups the lowest percentage of clean fruit, except on the unsprayed one, occurs in the group where all the sprays were applied in the form of a mist. One cannot expect, however, mathematical accuracy in tests of this kind, as there are many factors to be taken into consideration in arriving at results. Where all "force" sprays were used in the same experiment much more satisfactory results were obtained. As a matter of fact, the force sprays on the whole gave greater satisfaction than the mist sprays. "Force sprays" are got by holding the nozzle of the spray pump close up to its work, while "mist sprays" are applied to those where the nozzle is held at a distance, so that the spray may fall in the form of a mist on fruit and leaves. The operator must, however, use discretion in applying his spray, and force should be used to drive it in between any fruit growing in close

clusters, otherwise the codlin will not be affected if attacking where the apples are touching.

The experiments go to show that no spray can be omitted without loss of fruit from codlin attacks. The calyx and February sprays are most important, and should not be overlooked.

Arsenate of lead was used in the experiments, and was taken from the stock used by the growers in whose orchard the experiments were conducted, so that it could not be said advantage was obtained by the use of any special brand.

As reported by the Government Agricultural Analyst, all brands of arsenate of lead on the market are sufficiently high in arsenious acid content to be effective against codlin, if applied at the right times.

It cannot be too firmly impressed upon growers, the necessity of having the spray applied a short time before the attack of the codlin, as after the grub enters the apple, no amount of spraying will have any effect. As climatic conditions have an influence on the life history of the moth, the applications of the spray will require to be increased during a long spell of hot dry weather.

To obtain a comparison of the value of strengthening the spray, duplicate groups were sprayed with an increase of, approximately, 50 per cent. of arsenate of lead.

AVERAGE PERCENTAGE OF CLEAN FRUIT IN THE DIFFERENT GROUPS.

Strength of Sprays.	No Spray given.	All Sprays given.	1st Spray omitted.	2nd Spray omitted.	3rd Spray omitted.	4th Spray omitted.	5th Spray omitted.
4 and 5 lbs to 100 gallons..	44·19	97·51	94·23	97·07	95·9	95·24	96·85
6 and 7 lbs to 100 gallons..	..	97·07	91·56	93·3	95·93	95·96	97·25

The results show that no advantage, generally speaking, was obtained by this increase. The stronger solution was slightly more effective when applied on the last sprays of the season, while the weaker held preference in the earlier sprays. Their demonstration of this fact will be of considerable monetary value to growers, as not a few make it a practice to apply solutions of even greater strength than was used in the experiments.

All codlin-attacked apples that fell throughout the season and that were on the trees at the time of picking were counted in the experiments carried out at Kilsyth, Harcourt, and Londrigans, while at Hastings only those on the trees at the time of picking were taken in the count.

The experiments at Kyabram, Amphitheatre, and Diamond Creek were carried out in a more general way, but with equally satisfactory results.

Details of Experiments at Mr. Tompkins' Orchard, Kilsyth.

APPLES.

(Conducted by Orchard Supervisor Farrell.)

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied.
A. 3 Jonathan Apples	965	40	96	1st. 28.10.21 2nd. Omitted 3rd. 13.12.21 4th. 12.1.22 5th. 3.2.22	4 lbs. to 100 gals. 4 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals.	Mist
B. 3 Jonathan Apples	862	107	88.95	1st. Omitted 2nd. 16.11.21 3rd. 13.12.21 4th. 12.1.22 5th. 3.2.22	Same as A ..	Mist
C. 3 Jonathan Apples (check)	290	476	37.85	Unsprayed		
D. 3 Jonathan Apples	1,110	57	95	1st. 28.10.21 2nd. 16.11.21 3rd. 13.12.21 4th. 12.1.22 5th. 3.22.2	Same as A ..	Force Mist
E. 3 Jonathan Apples	927	75	92.5	1st. 28.10.21 2nd. 16.11.21 3rd. 13.12.21 4th. Omitted 5th. 3.2.22	Same as A ..	Force Mist
F. 3 Jonathan Apples	2,069	62	97	1st. 28.10.21 2nd. 16.11.21 3rd. 13.12.21 4th. 12.1.22 5th. Omitted	Same as A ..	Mist
G. 3 Jonathan Apples	860	19	97.8	1st. 28.10.21 2nd. 16.11.21 3rd. 13.12.21 4th. 12.1.22 5th. 3.2.22	Same as A ..	Force

DUPLICATE GROUP.

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied.
A. 3 Jonathan Apples	790	87	90	1st. 28.10.21 2nd. Omitted 3rd. 13.12.21 4th. 12.1.22 5th. 3.2.22	6 lbs. to 100 gals. 6 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals.	Mist
B. 3 Jonathan Apples	769	98	88·69	1st. Omitted 2nd. 16.11.21 3rd. 13.12.21 4th. 12.1.22 5th. 3.2.22	Same as A ..	Mist
C. 3 Jonathan Apples (check)	171	74·0	18·77	Unsprayed		
D. 3 Jonathan Apples	668	80	89·3	1st. 28.10.21 2nd. 16.11.21 3rd. 13.12.21 4th. 12.1.22 5th. 3.2.22	6 lbs. to 100 gals. 6 lbs. to 100 gals. 6 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals.	Force Mist
E. 3 Jonathan Apples	943	90	91·28	1st. 28.10.21 2nd. 16.11.21 3rd. 13.12.21 4th. Omitted 5th. 3.2.22	Same as D ..	Force Mist
F. 3 Jonathan Apples	786	46	94·47	1st. 28.10.21 2nd. 16.11.21 3rd. 13.12.21 4th. 12.1.22 5th. Omitted	Same as D ..	Mist
G. 3 Jonathan Apples	662	31	95·52	1st. 28.10.21 2nd. 16.11.21 3rd. 13.12.21 4th. 12.1.22 5th. 3.2.22	Same as D ..	Force

Details of Experiments at Mr. Tompkins' Orchard, Kilsyth.

Pears.

(Conducted by Orchard Supervisor Farrell.)

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied
A. 3 Howell Pears ..	1,120	10	99·17	1st. 18.10.21 2nd. Omitted 3rd. 16.11.21 4th. 13.12.21 5th. 12.1.22	4 lbs. to 100 gals. 4 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals.	Mist
B. 3 Howell Pears ..	1,038	32	97	1st. Omitted 2nd. 28.10.21 3rd. 16.11.21 4th. 13.12.21 5th. 12.1.22	 4 lbs. to 100 gals. 4 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals.	Mist
C. (check) 1 Howell Pear ..	250	207	54.7	Check unsprayed		
D. 3 Howell Pears ..	1,018	67	93·8	1st. 18.10.21 2nd. 28.10.21 3rd. 16.11.21 4th. 13.12.21 5th. 12.1.22	4 lbs. to 100 gals. 4 lbs. to 100 gals. 4 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals.	Force Mist
E. 3 Howell Pears ..	1,047	10	99	1st. 18.10.21 2nd. 28.10.21 3rd. 16.11.21 4th. Omitted 5th. 12.1.22	4 lbs. to 100 gals. 4 lbs. to 100 gals. 4 lbs. to 100 gals. 5 lbs. to 100 gals.	Force Mist
F. 3 Howell Pears ..	1,156	18	98·46	1st. 18.10.21 2nd. 28.10.21 3rd. 16.11.21 4th. 13.12.21 5th. Omitted	4 lbs. to 100 gals. 4 lbs. to 100 gals. 4 lbs. to 100 gals. 4 lbs. to 100 gals.	Mist
G. 3 Howell Pears ..	710	9	98·74	1st. 18.10.21 2nd. 28.10.21 3rd. 16.11.21 4th. 13.12.21 5th. 12.1.22	4 lbs. to 100 gals. 4 lbs. to 100 gals. 4 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals.	Force

Duplicate Group.

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied
A. 3 Keiffer Pears ..	1,630	136	92	1st. 11.10.21 2nd. Omitted 3rd. 16.11.21 4th. 13.12.21 5th. 12.1.22 6th. 3.2.22 7th. 1.3.22	6 lbs. to 100 gals. 6 lbs. to 100 gals. 6 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals.	Mist
B. 3 Keiffer Pears ..	1,890	163	92	1st. Omitted 2nd. 28.10.21 3rd. 16.11.21 4th. 13.12.21 5th. 12.1.22 6th. 3.2.22 7th. 1.3.22	Same as A ..	Mist
C. 3 Keiffer Pears ..	1,670	637	72·38	Unsprayed		
D. 3 Keiffer Pears ..	2,455	57	97·73	1st. 11.10.21 2nd. 28.10.21 3rd. 16.11.21 4th. 13.12.21 5th. 12.1.22 6th. 3.22.2 7th. 1.3.22	Same as A ..	Force Mist
E. 3 Keiffer Pears ..	2,883	71	97·59	1st. 11.10.21 2nd. 28.10.21 3rd. 16.11.21 4th. Omitted 5th. 12.1.22 6th. 3.2.22 7th. 1.3.22	Same as A ..	Force Mist
F. 3 Keiffer Pears ..	2,750	52	98·14	1st. 11.10.21 2nd. 28.10.21 3rd. 16.11.21 4th. 13.12.21 5th. Omitted 6th. 3.22.2 7th. 1.3.22	Same as A ..	Mist
G. 3 Keiffer Pears ..	1,314	20	98.5	1st. 11.10.21 2nd. 28.10.21 3rd. 16.11.21 4th. 13.12.21 5th. 12.1.22 6th. 3.2.22 7th. 1.3.22	Same as A ..	Force

Details of Experiments at Mr. Butuch's Orchard, Harcourt.

APPLES.

(Conducted by Orchard Supervisor Cock.)

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied.
A. 3 Munro Apples ..	6,596	94	98·6	1st. 25.10.21 2nd. Omitted 11.11.21 3rd. 2.12.21 4th. 20.12.21 5th. 16.1.22 6th. 6.2.22	4 lbs. to 100 gals. 4 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals.	Mist
B. 1 Munro Apple ..	1,104	386	74·1	Unsprayed		
C. 3 Munro Apples ..	4,434	204	95·6	Same as A, but 5th spray omitted	Same as A ..	Mist
D. 3 Munro Apples ..	4,753	163	96·7	Same as A, but 4th spray omitted	Same as A ..	Force
E. 2 Munro, 1 Rymer	5,820	343	94·5	Same as A, but 1st spray omitted	Same as A ..	Force
F. 2 Munro, 1 Rymer	4,243	342	92·6	Same as A, but 6th spray omitted	Same as A ..	Mist
G. 3 Munro Apples ..	3,935	287	93·2	Same as A, but 3rd spray omitted	Same as A ..	Force

DUPLICATE GROUP.

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied.
A. 3 Rymer Apples ..	8,180	430	95	1st. 31.10.21 2nd. Omitted 3rd. 2.12.21 4th. 20.12.21 5th. 16.1.22 6th. 6.2.22 7th. 28.2.22	6 lbs. to 100 gals. 6 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals.	Force
B. 3 Rymer Apples ..	4,681	590	88·8	1st. Omitted 2nd. 11.11.21 3rd. 2.12.21 4th. 20.12.21 5th. 16.1.22 6th. 6.2.22 7th. 28.2.22	Same as A ..	Mist
C. 3 Rymer Apples ..	7,747	520	93·7	Same as B, but 3rd instead of 1st spray omitted	Same as A ..	Force
D. 1 Rymer Apple ..	1,182	721	62·1	Unsprayed		
E. 3 Rymer Apples ..	5,010	105	98	Same as C, but 5th spray omitted	Same as A ..	Force
F. 3 Rymer Apples ..	5,215	256	95·3	Same as E, but 6th spray omitted	Same as A ..	Mist
G. 3 Rymer Apples ..	5,449	397	93·2	4th and 7th sprays omitted	Same as A ..	Mist

Details of Experiments at Mr. Stockton's Orchard, Hastings.

(Conducted by Orchard Supervisor Wadeson.)

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied.
A	3,761	144	96·2	1st. 3.11.21 2nd. Omitted, 17.11.21 3rd. 19.12.21 4th. 17.1.22 5th. 16.2.22	4lbs. to 100 gals. 4 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals.	Mist
B	3,713	142	96·3	Same, as A, but 1st spray omitted	Same as A ..	Mist
C	168	272	38	Unsprayed		
D	2,230	45	98	Same as A, but 3rd spray omitted	Same as A ..	First spray force, later ones mist
E	1,828	47	97·5	Same as A, 4th spray omitted	Same as A ..	First spray force, others mist
F	3,021	137	95·6	Same as A, 5th spray omitted	Same as A ..	Mist
G	3,270	45	98·6	Same as A, but no spray omitted	Same as A ..	Force
H	2,577	24	99	Same as G ..	Same as A ..	First three force, next two mist
I	2,862	45	98·4	Same as G ..	Same as A ..	Mist

DUPLICATE GROUP.

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied.
A	2,647	102	96·2	1st. 3.11.21 2nd. Omitted, 17.11.21 3rd. 19.12.21 4th. 17.1.22 5th. 16.2.22	6 lbs. to 100 gals. 6 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals.	Mist
B	2,336	124	94·9	Same as A, but 1st spray omitted	Same as A ..	Mist
C	168	272	38·2			
D	5,336	105	98	Same as A, but 3rd spray omitted	Same as A ..	First spray force, remainder mist
E	3,664	66	98·1	Same as A, but 4th spray omitted	Same as A ..	First spray force, remainder mist
F	3,732	58	98·4	Same as A, but 5th spray omitted	Same as A ..	Mist
G	3,427	19	99·4	All sprays given	Same as A ..	Force
H	3,903	11	99·7	Same as G ..	Same as A ..	First three force, next two mist
I	4,802	21	99·5	Same as G ..	Same as A ..	Mist

Details of Experiment at Messrs. Swan Bros.' Orchard, Londrigans.

(Conducted by Orchard Supervisor Cole.)

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied.
A. 3 trees	1,350	42	96·9	1st. 25.10.21 2nd. 8.11.21 3rd. 24.11.21 4th. 16.12.21 5th. 6.1.22 6th. 10.2.22	6 lbs. to 100 gals. 6 lbs. to 100 gals. 6 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals. 7 lbs. to 100 gals.	Mist Force Mist (3rd–6th)
B. 3 trees	1,545	109	93·4	Same as A, 1st spray omitted	Same as A ..	Mist
D. 3 trees	1,712	69	96·1	Same as A, 3rd spray omitted	Same as A ..	First force, four others mist
E. 3 trees	1,954	62	96·9	Same as A, 4th spray omitted	Same as A ..	First two force, then mist sprays
F. 3 trees	1,524	121	92·6	Same as A, 5th and 6th sprays omitted	Same as A ..	Mist
G. 3 trees	1,569	118	93	Same as A, 2nd and 6th sprays omitted	Same as A ..	Force

DUPLICATE GROUP.

Groups of Trees.	Clean Fruit.	Affected Fruit.	Percentage of Clean Fruit.	When Sprayed.	Strength of Spray.	How applied.
A. 3 trees	1,959	93	95·4	1st. 25.10.21 2nd. Omitted, 8.11.21 3rd. 24.11.21 4th. 16.12.21 5th. 5.1.22 6th. 10.2.22	4 lbs. to 100 gals. 4 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals. 5 lbs. to 100 gals.	Mist
B. 3 trees	983	65	93·7	Same as A, 1st spray omitted	Same as A ..	Mist
C. 3 trees	276	1,412	16·3	Unsprayed		
D. 3 trees	1,284	46	96·5	Same as A, 3rd spray omitted	Same as A ..	First spray force, then four mist sprays
E. 3 trees	1,635	170	90·5	Same as A, 4th spray omitted	Same as A ..	First spray force, then four mist sprays
F. 3 trees	1,224	35	97·2	Same as A, 5th spray omitted	Same as A ..	Mist
G. 3 trees	1,610	19	98·8	All sprays applied	Same as A ..	Force

THE CONTROL OF THE GRUB OF THE POTATO MOTH.

By J. T. Ramsay, Potato Expert.

Potato-growers throughout the Commonwealth have for many years sustained very heavy losses from the damage done to potato tubers by the grub of the potato moth.

The actual damage is effected by the larvæ of the moth (*Lita solanella*) attacking the tubers by penetrating the skin and tunnelling their way through the flesh, thereby rendering the tubers unfit for consumption. The tubers may be damaged either before or after harvest.

Many efforts have been made to combat the ravages of this pest—(i) by treatment of the seed; (ii) by spraying growing crops; (iii) by storage in moth-proof chambers; and (iv) by cultivation.

Up to the present season, only the last treatment has proved in any degree feasible and successful.

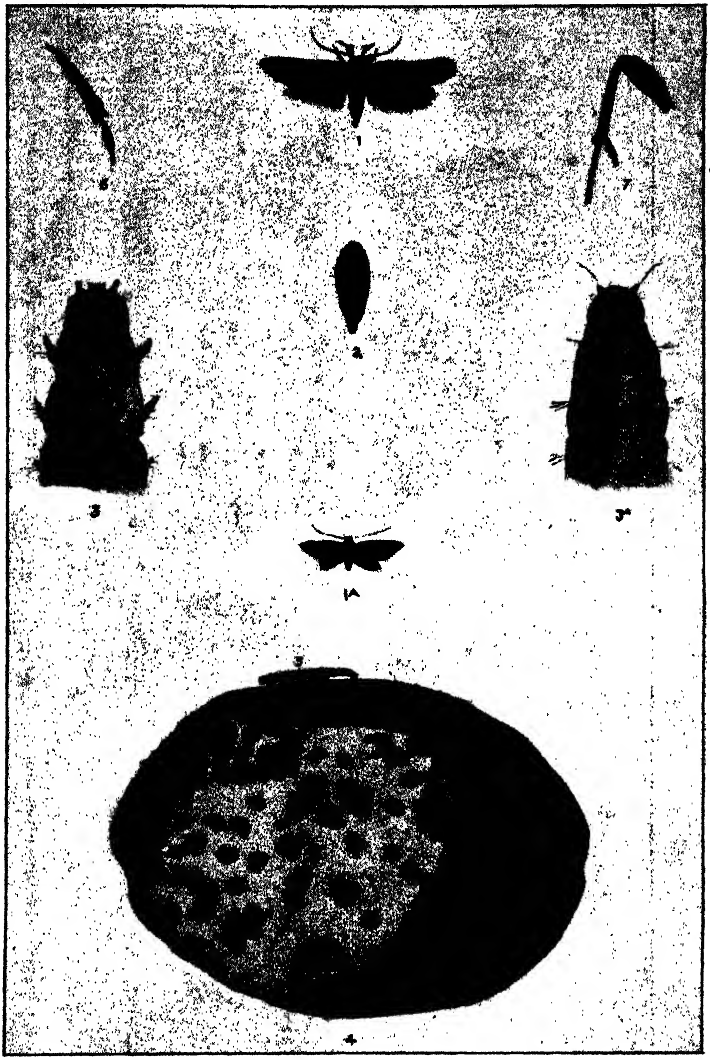
Treatment of the seed has hitherto been found ineffective (in a practicable way), either for the protection of the seed (without impairment of the germinating power) or for the protection of the crop grown from treated seed.

Spraying the crop is too expensive, because even with a spray capable of killing the moth egg and grub (and it is doubtful if a spraying solution with this efficiency, which would not damage the crop, can be compounded), continuous spraying would have to be made on areas planted with potatoes to prevent infection from insects harbored on other host plants outside of, but adjacent to, these areas. This can easily be understood when it is pointed out that the increasing leaf surface due to growth would, until development of the haulms ceased, continually present an untreated portion as an invitation to the moth. Spraying, therefore, though possible, is not practicable.

Storage in moth-proof chambers is also impracticable, because—(i) it is almost certain that infection would be accomplished before storage could be effected; and (ii) because the erection and maintenance of moth-proof chambers would be prohibitive.

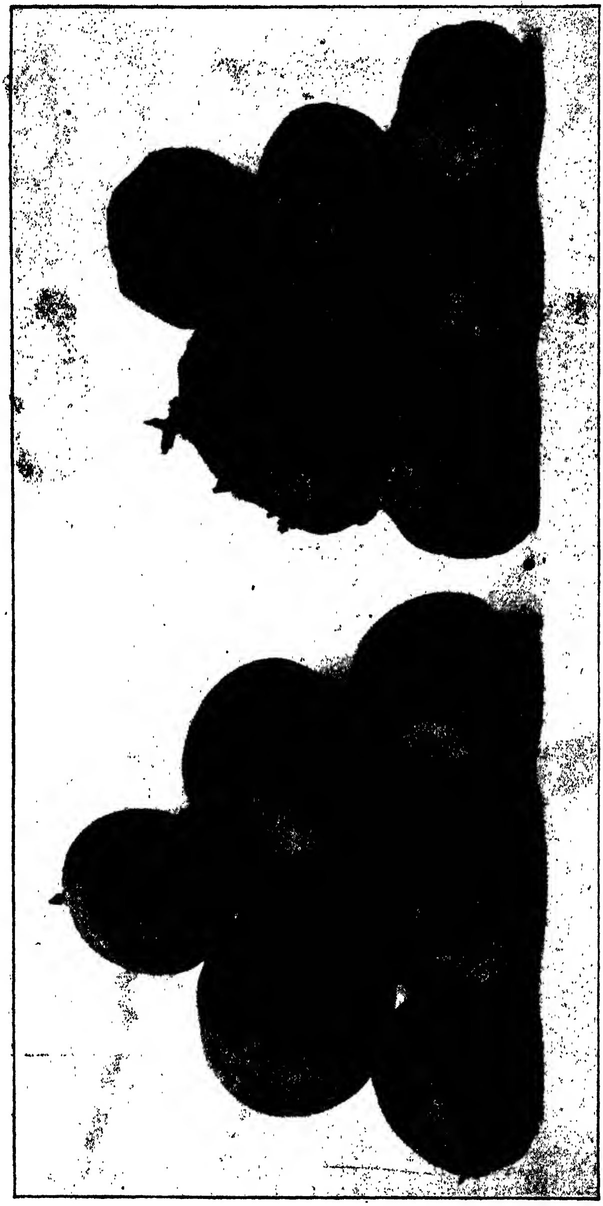
Fumigation as a means of combat is ruled out of court for the same reason. These arguments can be appreciated by growers who have, from year to year, suffered losses, partial or complete, from this insignificant-looking but powerful enemy.

It has been demonstrated that, by keeping the soil in which the crop is grown well tilled, so that a fine mulch can be moulded over the tubers, the grub is prevented greatly from getting access to these. Where cultivation is bad, the tubers in any soil are placed directly at the mercy of the grub. Loose sandy soils give the best protection; but unless this class of soil is kept well tilled or moulded over the rows of the crop, it is liable to be washed down by rains, or blown down by wind, to such a degree that the tubers nearest the surface are exposed to the air, and, incidentally, to the grub.



Potato Moth (*Lita Salanella*, Boisd).

1. Moth. Magnified.
1A. Moth. Natural size.
2. Pupa. Magnified.
3. Head and first three segments of larva. Upper side. Magnified.
3A. Head and first three segments of larva. Under side. Magnified.
4. Potato sliced to show effects of attack by larvæ of moth. Natural size.
5. Larva. Natural size.
6. Foreleg. Moth.
7. Hindleg. Moth.



1.—Treated seed—preserved clean.

2.—Untreated seed—100 per cent. damaged.

Soils of a loamy or clayey character, if not well cultivated, are liable to become baked or caked on the surface by the action of rain. Subsequent drying by sun and wind tends to crack this caked surface into tiny fissures by route of which the grub gets easy access to the tubers.

Good cultivation is found a great protection to the crop from the damage by grubs, but it has its limit of protection found when harvesting commences. Immediately the tubers are exposed by hand or mechanical digging, the moth, in seasons favorable to it, makes its appearance, lays its eggs on the exposed tubers, and the grower is in trouble, for within a few days the eggs are hatched, and the larvæ actively engaged on the potatoes.

Growers are only too well aware of the rapidity and extensiveness of the work of this pest, and will agree that bagging or removal cannot be done, in a practical way, quickly enough to defeat the attack of the ubiquitous moth.

A considerable measure of relief is now placed at the hands of growers in the form of an emulsified oil compound known as Tuberol. There was submitted to this Department in February last a quantity of this compound, for which it was claimed, amongst other things, that it would effectively prevent damage to potatoes by grub.

The importance of any material having this property, capable of being used in a practical and economical way, being so great, it was subjected to a trial under conditions similar to those prevalent in places where potatoes are usually stored.

A description of the test, and the results obtained, are given hereunder.

For the purpose of the test, a supply of (*a*) perfectly clean tubers; and (*b*) grub-infested tubers, was secured.

On 27th February, 1922, these were subjected to the following treatments, all of the tubers being unsprouted and of recent digging:—

- (i) Clean tubers were immersed in a 1 in 30 solution of Tuberol for 15 hours.
- (ii) Infested tubers were immersed in a 1 in 30 solution for 15 hours.
- (iii) Infested tubers were immersed in a 1 in 30 solution for 5 minutes.
- (iv) Infested tubers were left untreated.
- (v) Five lots of clean tubers were immersed in a 1 in 30 solution for 5 minutes.
- (vi) Two lots of clean tubers were left untreated for a check.
- (vii) Infested tubers untreated were stored adjacent to the above variously treated lots, so that the active moth and grub would environ the whole of the stocks subjected to the test.

The period of the test extended from 27th February, 1922, till 31st August, 1922.

The moth and the grub were very active from the beginning of the test till early in June, a period of about 3 months.

All of the various treatments were under practically daily observation from the beginning of the test till the end of August, before which time the activity of the grub had apparently ceased.

The results are tabulated hereunder:—

Lot.	Remarks.	Percentage free from Grub.	Percentage affected by Grub.	Condition of Sprouts.
I.	Grubs were at times noticed crawling over these, but the tubers remained undamaged	100	None	All well sprouted and healthy
II.	An odd dead grub was found on these	None	100	Majority of sprouts destroyed by grub, the balance being healthy
III.	A few dead grubs were found on these	None	100	A few sprouts destroyed, the balance healthy
IV.	Tubers practically useless ..	None	100	All sprouts destroyed
V.	Tubers remained perfectly clean, though the grub was at times noticed on them	100	None	Well sprouted, all healthy
VI.	All damaged, and practically useless	None	100	All sprouts damaged
VII.	Tubers practically useless ..	None	100	All sprouts damaged

The results are remarkably even. It is considered that the test, as carried out, was equally severe with any condition that would obtain in the ordinary storage of seed potatoes, yet, in not one case was a treated tuber damaged by the grub, although grubs surrounded and crawled over them. The fact that sprouting is not affected by the solution, and that an immersion of five minutes is sufficient to render tubers immune from damage, is of great importance to the grower. That tubers intended for consumption could be protected from damage is proved, but no opinion can be given at present as to whether the cooking flavour or quality would be affected, as all of the lots utilized in the test were stored throughout in a well-lit room, and were therefore rendered unfit for table use owing to the greening effect of the daylight.

It is estimated that 1 gallon of the compound would make sufficient dip to treat 2 tons of potatoes; and, of course, the greater the quantity treated the less material would be necessary per ton.

Illustrations are given of various stages of the grub pest, and of tubers treated and untreated.

COW TESTING ASSOCIATIONS.

OBJECT, FORMATION, AND MANAGEMENT.

Object.

The object of a Cow Testing Association is the gradual elimination of those cows which show least profit, so that a herd may consist of wholly profitable units. There is no other way than testing by which this knowledge may be obtained. *Every cow should be tested* regularly and continuously, so that those becoming unprofitable may be rejected without delay.

Formation.

When several dairy farmers in a neighbourhood become interested in the question, a meeting of all the dairy farmers of the district should be convened by one of the number. Preferably the meeting should be held on a date convenient for the attendance of an officer of the Department of Agriculture, who would address the meeting on the subject of testing, and give such information as would enable his hearers to clearly apprehend the advantages to be gained by pursuing a methodical and thorough system of testing.

Those present at this meeting might there and then resolve to form an Association, appointing a secretary (*pro tem.*) meanwhile, and preparing a list of all the dairy farmers of the district, with the number of cows each possesses, with a view to securing their interest and their attendance at a meeting to be held at a date not too far removed from the preliminary meeting.

Membership.

Membership of the Association should be open to any person in the district who is engaged in the production of milk as a means of, or towards, a livelihood, and who will undertake to observe the rules of the Association.

Conditions of membership should be made as simple as possible, but should embrace some vital principles, such as:—

(*a*) *Each member will pay an annual subscription,* the amount of which will be determined by the total expenses of the Association, carefully and economically estimated, and based upon a rate per cow. This subscription should be paid in advance, either in full or in two instalments, with a proviso that any expenditure over and above the estimate be shared by members on the same basis, provided that such expenditure has been officially sanctioned. On this, see also paragraph "Finance."

(*b*) *Each member should give an undertaking to continue in membership for a period of at least two years,* provided that he may be released from membership in the event of his discontinuing dairy farming, or removing from the district meanwhile.

(*c*) *Each member should pledge himself to faithfully observe the rules and requirements of the Association* for such time as he shall continue in membership.

By a general observance of these principles the work will not be retarded by lack of funds; the members will feel assured of continuity of effort throughout the whole of the initial period, and the undoubted results will establish the confidence of members in the effectiveness of their methods.

In most Associations formed hitherto some members have discontinued at the end of the first year, in a mistaken belief that one year's testing was sufficient, and the numerical strength of the Association has been kept up only by continued effort to secure new members, which is not at all satisfactory.

In Denmark, each member of such an Association must give a written guarantee of five years' support, from which he may be relieved only by his discontinuance of dairy farming, or equally good reasons.

Whilst a guarantee for such a lengthy period as five years may not be practicable in this country, a two years' undertaking would result in satisfactory work—a farmer being able thereby to note the progress made as a result of the first year's culling.

Each successive year will be attended by evidence of continued improvement. The heifers from the cows tested during the first year will be ready for test in the third season, and so each succeeding year will bring to the judgment of the Scales and Babcock Tester a fresh lot of heifers from the best cows, and only the best of these will be retained, particularly if the herd remain stationary in numbers, when the owner cannot possibly absorb the whole of his heifers each year.

Management.

One competent man is required to effect tests, keep records, conduct correspondence, receive and despatch bottles, &c. With 2,200 cows under test, the time of a capable man would be fully occupied throughout the season. Very few men suitable for the work will be found willing to take it up for one season only, and frequent changes are undesirable. To attract a suitable man, some degree of permanency should attach to the position—with, of course, the usual safeguards.

Here, again, the necessity for a solid foundation for the Association is demonstrated. Added to what has already been said, it may now be laid down that a good Association should embrace 2,000 cows, or more. Not that an Association embracing 1,500 cows would not be profitable, but as one capable man can test from 2,000 to 2,200 cows, the better plan is to work to the full capacity, and pay a good salary to a capable man rather than to offer less work with a correspondingly smaller salary to a less capable man.

Another advantage of a 2,000 cow basis is that, of course, the cost per cow would be less than in an Association involving a lesser number.

The salary which should be paid to a competent officer would vary with circumstances, but an Association having under test 2,000 cows or more, could easily pay £4 weekly without an undue tax upon the members.

The officer's duties may be more fully defined as follows:—

To attend to all correspondence;
To keep a proper record of all expenditure;
To cleanse all bottles, glassware, &c., used in the test;

To receive from members of the Association their samples of milk, and test the same;

To record results of test and compile from such records tables showing:—

(*a*) Total weight of milk given for the period and for the season by each cow;

(*b*) Total weight of butterfat contents of milk given for the period and for the season by each cow;

(*c*) The average quantity of milk and butterfat, and average test, per cow in each herd; the average association cow, &c.

Finance.

A Herd Testing Association could be worked most economically from the local dairy factory (where one is in operation), as steam for power and cleansing would be there available and the cost of purchase and installation of a boiler would thereby be avoided.

In fact, in the case of the smaller Association, an arrangement might be made for the use of factory apparatus entirely, and thus the initial outlay would be appreciably reduced. The charges then to be met would be made up of officer's salary, freights, acid, and stationery; and, excepting salary, those charges would be light, particularly in districts where the boxes could be carried by the factory company's waggons.

In some instances factory proprietors have furnished an Association with a room and with steam free of charge, and, indeed, it might well pay them so to do, for increase in production from herds under test would be reflected in better factory returns.

But even if an office had to be provided, the cost would not be considerable. If rented, the rent would not amount to a great deal, and if specially constructed, the cost would be about £100, and the provision for interest on capital expenditure and ordinary depreciation would not appreciably add to the charges on each member of the Association.

The financing of such an Association is frequently undertaken by the factory company operating in the district, and the plan usually adopted, and which has proved mutually satisfactory, has been on lines as follow:—

Apart from the purchase of each member's outfit, comprising box for milk samples, bottles, labels, spring-balance scales, dipper and lock, the Association has been financed by the dairy company, and at the end of the season the cost has been distributed *pro ratâ* over the number of cows under test, and members debited accordingly.

A charge of 9d. per cow has sufficed for each member's outfit, with a small margin over actual cost, and this margin has practically sufficed for such expenses as postage and stationery.

A further charge of from 2s. 9d. to 3s. per cow per annum has been found sufficient to cover the cost of testing and working expenses, including salary.

Equipment.

The equipment required at the testing centre and approximate cost of same is as follow:—

APPARATUS.

	£	s.	d.
1 36 to 40 bottle Babcock Tester—say	13	0	0
24 dozen test bottles, at 12s. per dozen	14	8	0
6 17.6 milk pipettes, at 1s.	0	6	0
1 specific acid hydrometer	0	3	0
1 divider	0	1	0
1 20-oz. acid measure	0	3	0
1 acid burette and stand (metal)	0	17	0
6 test bottle cradles (holding 36 to 40 each) ..	1	1	0
Bingham's butterfat tables	1	8	0
Sundry fittings	3	0	0
	£34	7	0

It would be found advisable to order all apparatus required in good time, as large stocks, particularly in some of the lines, are not always held here.

BOXES.

Each member must be provided with a box of 4-oz. bottles, the number of bottles equalling, of course, the number of cows in his herd. Boxes with capacities of 20, 32, 40, and 50 bottles could be obtained at a cost of 7s. 6d. to 10s. each.

BOTTLES.

Bottles to contain 4 ounces, such as are used by the Department of Agriculture, would prove most suitable. The cost of these is about 15s. per gross, and corks would cost about 4s. a gross.

Methods—Districts and Numbers.

When the number of cows to be tested has been definitely ascertained, the district should be divided, as nearly as possible, equally, each district including about 1,000 cows. Those farms nearest to the main factory or depôt would form one district, the outlying farms would constitute the second. By such an arrangement the tester's work can be better organized.

Each herd under test should be given a number, and to avoid confusion and facilitate the testing officer's work, the number of cows in each district or section of a district should be indexed thus:—

A district having three divisions would show as—

A.—Allansford.
B.—Mepunga.
C.—Nirranda.

The herd number in each of those districts would then appear as—A1, A2, A3, and so on; B1, B2, B3; C1, C2, C3, &c.

Herd numbers would be attached to members' box keys by a brass or other tag, and they could also be stencilled on the front face of the box itself, then, if the boxes were placed one on top of the other, identification could be effected with little trouble.

Cow Testing Forms.

Forms as per the specimens attached should be used. Two copies of Form No. 1 should be enclosed in the box of sample bottles when it is sent to a member, and on these he will enter the weights of two milkings from each cow and return one of the completed forms to the testing depôt with the samples. The testing officer will complete the column for fat percentage when he tests the milk.

The total weight of milk for the day and the percentage of butterfat is now transferred to the office copy, and this Form 1 is now finished with.

The particulars are now transcribed from the office copy to Form 2, and this is forwarded to the member when his box of sample bottles is returned to him for the next test. Form 2 provides for additional information below the records of individual cows, viz.:—

Yield of average cow of the herd for 30-day period.
Milk lbs.
Test per cent.
Butterfat lbs.

The calculations are based on 30-day periods, comparisons being thus more readily made.

Duties of Members.

Each member of the first division should weigh the milk of each cow at two successive milkings between the 16th and the 21st of the month, and at each such two successive milkings pour a sample of each cow's milk into the bottle which is labelled with a number corresponding with the number of the cow concerned. A sample should consist of approximately one-half ($\frac{1}{2}$) ounce of milk for each 10 lbs. of milk yielded. These samples should reach the testing depôt not later than the 23rd of the month.

The members of No. 2 division receiving their boxes about the 22nd of the month should take their samples, in the manner set out in the preceding paragraph, between the 23rd and 28th of the month, and the samples should be in the hands of the testing officer not later than the 30th.

The foregoing arrangement would enable the testing officer to perform the whole work of testing at one portion of the month, and he will be able to give the remainder of his time to the compilation of his records and averages, together with other clerical work and despatch of boxes for next testing.

The allowance of five days in which samples may be taken is in order to allow for any minor ailments which some of the cows may be suffering, as, for instance, a rule is that sample shall not be taken from a cow that is "in season."

Appended are the forms which are suggested for the use of Cow Testing Associations.

....*Cow Testing Association*

Herd No...............

FORM No. 1.

OWNER—*Name*.. *Address*..

Date of Weighings..

Cows.					Weight of Milk.		Test.
Name.	Breed.	No.	Age.	Date of last Calving.	Morning. (lbs.)	Evening. (lbs.)	

....*Cow Testing Association.*

Herd No...............

FORM No. 2.

OWNER—*Name*.. *Address*..

Cow No.	Yield for 30-Day Period Ended....................			Total Yield from Calving to Date.		
	Milk. (lbs.)	Test.	Fat. (lbs.)	No. of Days.	Milk. (lbs.)	Fat. (lbs.)

Yield average cow this herd for 30-day period ....lbs. Test average cow this herd for 30-day period ......per cent.

Milk ,, ,, ,, ,, ...lbs. Fat ,, ,, ,, ,, ,, ...lbs.

....*Cow Testing Association.*

FORM No. 3.

(This Form is for use at the end of the season to show the position of every herd. A copy of this Report should be forwarded to the Chief Veterinary Inspector, Department of Agriculture, Melbourne.)

Report for Season Ended..

Herd No.	No. of Cows.	Herd Averages.			Highest Individual Yield. Calculated for Month.			Lowest Individual Yield. Calculated for Month.		
		Milk. (lbs.)	Test. (%.)	Fat. (lbs.)	Milk. (lbs.)	Test. (%.)	Fat. (lbs.)	Milk. (lbs.)	Test. (%.)	Fat. (lbs.)

WEEDS AND THEIR ERADICATION.

(Continued from page 480.)

(*By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.*)

Paterson's Curse or Purple Bugless, *Echium violaceum.* Fam.: Boraginaceæ.

Unfortunately this plant is steadily increasing its hold in Victoria, more especially in the northern districts, and should be destroyed wherever its presence is discovered.

It is also found in portions of South Australia where it is known as Salvation Jane, while in New South Wales it goes by the name of Blue Weed or Paterson's Curse; the latter name it is supposed to have received from one, Paterson, who is credited with having first introduced this plant into Australia.

The genus Echium contains several species, 60 of which are probably natives of Europe, E. violaceum being a native of Austria. The generic name of Echium is derived from Echis, a viper, from a supposed resenblance of their seeds to the head of that reptile.

Paterson's Curse (Fig. 47) is a coarse bristly biennial plant, which during its first year usually produces a rosette of large rough leaves surmounting a strong deeply penetrating tap-root. When it reaches maturity, it is an erect, sturdy plant, having lanceolate, sessile leaves, which, with the stems, are well clothed with bristly hairs that any one who has hand pulled the plants with bare hands and experienced the cactus-like nature of these bristly spines will not be anxious to repeat the experience. This same feature causes the stock to leave the matured plants severely alone.

The flowers are purple-blue in colour, numerous and forming a curved panicle from 2 to 3 feet in height, which gives the plant a most pleasing appearance when it is in full bloom and in complete possession of the ground to the exclusion of all other vegetation.

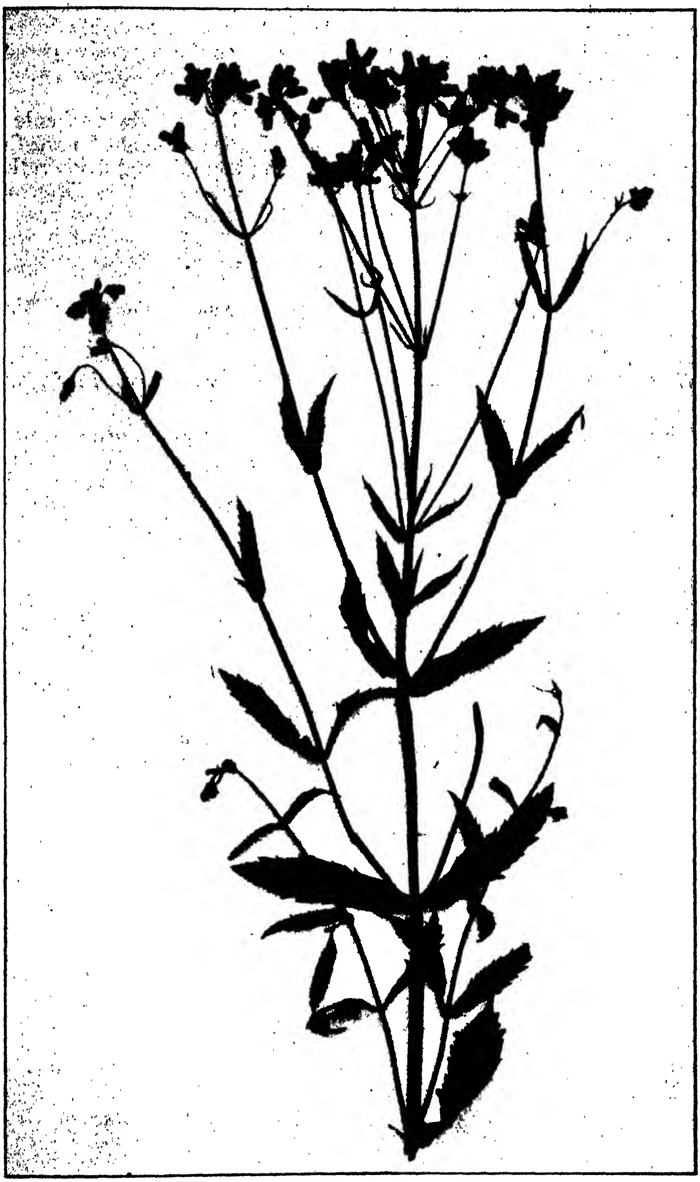
On account of its strong tap-root the so-called Paterson's Curse is a difficult plant to hand pull, even with the hands protected by gloves, and is best mattocked or spudded out. A good strong draw-hoe is a very useful tool for this purpose on land that is not of too stony a nature.

In dealing with light infestations a sharp lookout should be kept for the first year rosettes, as these are much more easily hoed out than if left until the flower stems have arisen; and with vigilance the plant need not be allowed to gain ground. In places where it has thoroughly established itself, it becomes a difficult and costly matter to again get the upper hand of it.

Sheep will freely eat the plant when it is young, and a flock could be utilized for this purpose. Repeated stocking with sheep would go a long way towards the eradication of this pest, and assist in keeping down the amount of hired labour otherwise required. Plants too far advanced for the sheep to eat should be grubbed out so as to prevent any chance of their seeding.

Paterson's Curse.

(From Professor A. J. Ewart's *Weeds, Poison Plants, and Naturalized Aliens of Victoria.*)



Wild Verbena, Vervain or Purple Top.

On land fit for cultivation the difficulty is much less than on grazing country, although on old infested arable land it would probably be some years before the soil was free of the pest, owing to the successive germination of dormant seeds being brought to the surface during cultural operations.

Where it is possible to use a mowing machine, the plants should be cut and burnt. On large areas spraying with brine would be worth a trial, especially if this were sprayed over the plants during dry weather.

Tests made with crude petroleum at Porepunkah against Paterson's Curse did not give the results anticipated. On enclosed land such as railway reserves, arsenical preparations would be most useful in combating this and other bad weeds in places having a handy water supply available.

Paterson's Curse or Purple Bugless is proclaimed under the Thistle Act for the State of Victoria.

Wild Verbena, Vervain, or Purple Top, *Verbena bonariensis*, L.

Fam.: Verbenaceæ.

This plant (Fig. 48) is a large herbaceous perennial, often growing to over 4 feet in height. It was introduced from South America, and like many other weed introductions is a most useless species, often taking possession of the ground to the exclusion of better species. This verbena is now widely spread in Australia and well established in many parts of Victoria in places as far apart as Bright, and Belgrave on the Gembrook line.

Its small but numerous flowers are arranged in dense terminal spikes and are of a bluish-purple hue, hence the name of Purple Top. The lanceolate leaves are sessile and from 1 to 3 inches long, diminishing in size towards the top of stems.

Stock always leave this plant untouched owing to its dry hirsute nature, and it should be hand pulled and burnt wherever found.

Verbena bonariensis is not a proclaimed plant under the Victorian Thistle Act, but in New South Wales it has been proclaimed in several municipalities and shires.

(To be continued.)

THE PRE-COOLING OF FRUIT FOR EXPORT.

SOME ASPECTS OF THE QUESTION.

By D. B. Adam, B.Agr.Sc., Department of Agriculture.

When considering this question some persons have been too prone to condemn the system on experience gained from mixed shipments of pre-cooled and non-pre-cooled fruit. Naturally, the latter gains every advantage from the pre-cooled fruit; a steadily falling temperature is much more to be desired than one initially low which rises and is subsequently lowered again, as happens with pre-cooled fruit with the present system of handling.

It is admitted that many shipments under favorable conditions arrive in London in perfect condition, and would not be improved by pre-cooling.

There comes a time, however, when conditions are not favorable, and it is in such shipments that pre-cooling would be of advantage. To make every shipment successful, uniform treatment should be given, and success should not be left to the fickleness of the weather.

Provided fruit is sound and properly handled there are two main factors which determine its successful shipment; these are: (1) temperature of fruit while loading; (2) size of shipment, which may affect its success inversely proportionally to the time taken to load it.

For a successful shipment: (1) if the temperature is low enough, it does not matter about the size of the shipment; (2) if the size of shipment is small, it does not matter what the temperature is, provided of course, it is not unreasonable.

If the temperature be high and the shipment large, failure is more likely.

To analyze this position, we may consider the question of temperature at loading. The most important point to grasp is that fruit picked from the tree is a living organism, it respires or breathes, and as a consequence, produces heat. Respiration and consequent heat production at high temperatures is considerable, this amount can be calculated from experimental data.

When fruit is kept under adiabatic conditions, *i.e.*, where the heat produced is not removed or added by any means, the rate of accumulation of heat at high temperatures is enormous. This feature may be noted on opening a not-iced insulated truck which has been loaded with warm fruit at some country centre, the heat being so great as to cause one to move away from the door and to leave it standing for a while. On no account should warm fruit be placed in an insulated truck unless plenty of ice is used, even then, a louvre, provided it is moving most of the time, is much to be preferred for carriage for any distance.

In order to picture unfavorable conditions for loading, I have taken the *Largs Bay's* maiden voyage.

The maximum shade temperatures on the days this boat was loading fruit at Melbourne, Adelaide, and Fremantle were—Melbourne 89° F., Adelaide 89° F., Fremantle 105 to 107° F. The temperature of the fruit would probably be, in the vicinity of, Melbourne 60° F., Adelaide 60° F., Fremantle 80 to 85° F.

Only a very small proportion of the 100,000 cases shipped was pre-cooled. Every one knows that for good keeping, fruit should be brought to 32° fairly quickly.

Now picture what the engineer has to do when there are, say, 30,000 cases at 68° F., in order to reduce the temperature to 32°.

In the ship's hold, if no heat be removed, how fast would heat accumulate? Experiments and calculation, show that at 68° F. the temperature would be, after 1 hour, 68.2°, after 10 hours 70°, after 20 hours 72.5° F. after 50 hours 82.5°, 100 hours, 125.5° F. After 120 hours fruit would reach its thermal death point.

At 32° we find that after 1 hour it has reached 32.03°, after 10 hours, 32.9°, after 50 hours it has risen to 34°, after 100 hours to 37° F. It takes 400 hours to rise to the same degree as the fruit in the first lot. How much easier it is to control this last shipment?

At higher temperature than 68° it is much faster; at 90° F. the fruit would kill itself in two days' time, under adiabatic conditions.

What has a ship's engineer to do? The main object in designing a ship's refrigeration apparatus is to carry fruit, not to chill the cargo and then carry it. The machinery installed is, in my opinion, insufficient to cope with 30,000 cases loaded quickly and warm, nor was it ever intended to do so. As seen in the figures above, the engineer has not only to reduce from 68° to 32°, the capital, as it were, but he must not allow the interest, or heat accumulating, to mount up. How soon, however, can he do this, especially in the centre of a chamber 60 feet wide, with air at the inlet at a minimum of 30° F.?

"Brown Heart," we are informed, is due to excessive concentrations of carbon dioxide coupled with a deficiency in oxygen. Since carbon dioxide is a product of respiration, its production is increased in the same proportion as was given for heat increase above, this also applies to the diminution of the oxygen supply. The result is that we may find in an unfavorably loaded shipment, "Brown Heart," over-heating and possibly frosting injury due to the anxiety of the engineer to cool quickly the centre of his load to a reasonable temperature.

The size of shipments has greatly increased in recent years. Comparing season 1914 with last year, we find that practically the same amount of fruit was exported in each year although of the 360,000 cases in 1914, about 200,000 went to Germany in German boats. The rest, about 160,000 cases, was taken to London in twenty-three boats, whose shipments averaged less than 5,000 cases each, and last year nineteen boats carried all the cargo to England, averaging 17,000 cases apiece. Certainly, Tasmania used to load as large cargoes as Victoria does now, but the average mean maximum temperature at Hobart is 6° less than Melbourne, and, furthermore, the chance of high temperatures during loading operations is much less than in Victoria, and it is these high temperatures which do harm, as we have seen.

Again, because of the smaller quantity of Victorian produce it was generally used to top the Tasmanian holds, and it thus derived benefit from cool fruit. Nowadays, Victoria has most of the hold to herself, the western States having their fruit put in with Victorian fruit, and thus gaining advantage by radiation and conduction from any fruit which has already been cooled, further delaying the cooling of the centre of the Victorian stack.

What, then, are the remedies? Firstly, if the holds were not opened again until London, it would certainly give more satisfaction than at present. However, if the fruit stored, being of necessity large, for the ship's economy, were about 70° F., the centre would certainly deteriorate, especially if late in the season when the apples are more forward.

Secondly, movable perforated iron columns connected to the suction ducts might be inserted in various parts of the hold, thus diminishing the distance between the inlet and outlet ducts and allowing for more rapid cooling. This method was, I believe, used with satisfaction by certain shipping companies before the war. It is a question of practical consideration whether this addition to the ship's equipment or pre-cooling would be the more satisfactory. Pre-cooling would, at present, necessarily be a matter of Inter-State or Federal action with the possible exclusion of Tasmania. At present the Victorian crop is hardly sufficient to guarantee a full hold for all boats. Those which were not filled could be finished off with pre-cooled South Australian fruit. This allotment of space would necessitate the closest co-operation. Tasmania with her larger bulk of fruit and lower temperature could arrange to practically fill a hold at any time. A small lot could be put in at Victoria if necessary to top it. Adding fruit pre-cooled to the right temperature would be quite satisfactory to all concerned.

Certainly, however, an experiment or experiments on a commercial scale are necessary to fully test the questions. The above, it was thought, would give something to reflect upon.

VITAMINES IN PIG FEEDING.

The first experiment to test the value of vitamines in pig feeding carried out at a recognised Agricultural Experiment Station that we have come across has been conducted at the Iowa station. The experiments were to determine the effects of adding substances carrying vitamines in abundance to the rations of pigs, consisting of maize, meat meal tankage, and salt self fed. The result showed that young pigs, after weaning, receiving in addition a quart of whole milk with 5 oz. of tomato juice, daily for the first sixty days, averaged 80 lbs. at ninety days old, or 25 lbs. more than a similar lot given a quart of milk only per day. This result represented an increase of 45 per cent. in final weight due to tomato juice, and compares with 44 per cent. increase for a similar lot receiving the juice of one orange daily, and with 41 per cent. increase for a further similar lot which received one egg a day instead of the tomato juice or orange juice. These results are decidedly interesting.

—*Live Stock Journal*, 30th June, 1922.

INCREASING THE MILK YIELD.

IMMEDIATE WORK.

By J. S. McFadzean, Senior Dairy Supervisor.

The season is again at hand when a reminder on the above line is opportune. Herd-testing as an essential part of the dairy-farm management is now being given consideration in many quarters, and several associations are actually in work. The testing of pure-bred herds by the Department of Agriculture is also being taken up enthusiastically by breeders.

In its earlier stages this herd-testing movement was not given much thought. The general idea was that it would take up too much time; but as its advantages become more widely known it is being made more use of each year, and with considerable profit to owners. In every new departure there are special points requiring attention, and in this work the outstanding necessity is a continuous supply of green feed.

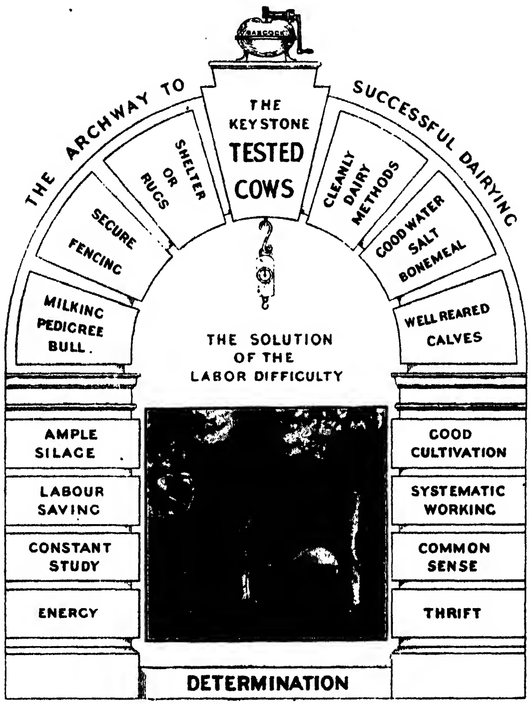
There should be no call to emphasize the fact that green feed is essential to a heavy milk flow. Every one who keeps cows should know that they give most milk when there is an abundance of grass in the flowering and early seeding stage. Whether every one knows this or not, the fact remains that too few make use of this natural condition in the management of their herds. Possibly hundreds of farmers are giving occasional thought to the more intricate problem of a "balanced ration" as a means of increasing the milk production of their herds, but many—very many—of these same people are overlooking the importance of their cows having a constant full supply of green feed.

A sufficiency of green feed for all the cows on every farm all the year round would far more than double Victoria's annual output in butter; therefore this subject cannot be urged with too much persistency. Half-an-acre of land per cow properly worked will keep every animal well fed throughout each year, and the cost of this will not exceed 30s. per cow, while the return will run to several pounds cash per cow according to the dairy quality of each animal. It is a poor crop of oats or barley which will not cut 5 tons of green stuff per acre, and with maize three times this weight will be a very low average estimate under proper cultivation. Again 30 tons of sugar-mangels would be a very medium cropping, and in fact all of these yields are exceeded by a big margin in each dairying district in which they have been tried.

There are successful dairy farmers in every district who work on these lines, and there are ten times as many more who know the value of green food, but who allow their cows to be unproductive over several months of each year for the want of reasonable feeding. Most farmers now recognise that the average land will not grow good crops without some manure or fertilizer. They also know that a half-starved horse cannot lift a full load. So will a poorly-fed cow fall very far short of her possible milk production. To make a test of the milk yield of a cow without having previously supplied abundance of green food from which to make milk is not fair to the cow, and is not likely to be

satisfactory to the owner. Feed them all the green feed they will eat each and every day, and cows will soon show their quality as milkers.

Cows which are insufficiently fed at any season will never put up their best yearly production. If they are out of condition in the spring through want of feed in the winter they take time to re-condition before they milk to their best. If there is not a full supply of green stuff for them right through the summer the yield will drop, and not recover again till the following calving. Only by a full and unbroken supply of green feed can cows be kept at their full milking limit, and to test them when on short rations is sheer waste of time.



As already stated, the spring grass is at its best for milk production when in the flowering and early seeding stage. The feeding quality of sappy green stuff can most easily be improved by the addition of a proportion of bran, crushed oats, lucerne chaff, or other more concentrated food, which will make up the value of the grass seed or cereal seed which is absent in the green stuff. When the feeding of the dairy herd has reached this stage, and there is a continuous supply in sight, the owner may give time to the study of a balanced ration as a means to further improvement; but there are few indeed in Victoria who have reached that commendable stage.

Consequent on the publicity which has been given to the advantages of irrigation, many people have come to consider that in the absence of such facilities they are unfavorably situated for dairying; but the fact is that many of the best feeders of dairy cows in the State are not on irrigation land. Apart from the irrigation areas there is actually no better country in the world for dairying than Victoria. Soil, climate, and rain distribution contribute to this, and make

Maize for Fodder.

dairying profitable without irrigation. Where there is no water for the irrigation of a permanent lucerne crop, tares are grown to take the place of this fodder; and when sown with a cereal crop tares improve its feeding value either as green stuff or hay, as well as increasing the bulk yield per acre. Mangels, pumpkins, and maize are all

widely grown without irrigation, and very heavy returns per acre are obtained.

Owing to the immense bulk that can be harvested from each acre, and its suitability for fodder at any stage of its growth, as well as the short period it takes to mature, maize stands out as the king of fodder crops. It is easy to grow and more easy to conserve as silage than any other crop; and taken all round it is a good milk-producing fodder, especially when seeding.

The Department of Agriculture is still advancing money for silo building on three years' terms, and under this system a silo will always have more than paid for itself before the payments are due. Eighty tons of silage represents 160 days supply of succulent fodder for a herd of 20 cows, and as the silo should be filled in the early summer with a cereal crop to use during the drier months, and again in the autumn with maize for winter feeding, an 80-ton silo will come close to keeping the average herd continuously supplied with succulent feed throughout the whole of the year, and the milk yield retained at its limit.

Ample green fodder makes profitable dairying a certainty. With good feeding cows will either milk well or fatten, according to their constitution. Without good feeding a cow will neither milk well or put on condition, and so no estimate can be made of her value. Now is the time to begin. A full supply of green feed for the herd at once opens up the way to profit through the cows producing either milk or beef. The method is simple in the extreme; and the wonder is why so many farmers should continue to work for only half their possible profit when full returns are so easily obtainable for the cows.

At this present date the first step to be made would be to order a silo from the Department or to see about getting one built privately. Application to the Chief Veterinary Officer, Department of Agriculture, Melbourne, will bring full information.

If the herd is a small one of about ten cows it may be possible to get through the year without a silo, if mangels, maize, and pumpkins are grown for autumn and winter feeding; but with a larger herd in the drier areas silage is a necessity.

Where land already broken up is not available for planting, an acre for mangels and another for the first sowing of maize should be prepared without any loss of time. That for the mangel crop should be extra well worked to give an even seed bed. Unless farm-yard manure is available in well-rotted condition, both mangels and maize will be improved by a dressing of superphosphate and bone-dust at time of sowing. Manure from poultry yard, sheep yard, or short stable manure broadcast over the drills after sowing will also be useful, as such manure works in when the crops are being hoed.

With both mangels and maize a more even germination of the seed is obtained by soaking it for two or three days prior to sowing, and it can be afterwards left to drain, covered over with a damp bag for a few more days without injury. Both these crops are best sown in drills 3 feet apart, so that the land between the rows can be worked with a horse hoe and the weeds kept down. These hoeings should

only break the surface, otherwise, with maize especially, the roots may be injured. Also in the rows the seed should never be closer than at 6-inch spaces. Each mangel seed usually produces three plants which have to be thinned out later, the strongest plant being left. Later on, if the crop promises well, the plants can be thinned out again so as to leave them 12 to 16 inches apart in the rows. The lower leaves of the mangel crop can always be used if other green fodder is scarce, and pigs, and poultry, and cows do well on them. From 1 inch to 2 inches is the full depth that mangels can be planted with safety, the latter being the depth required in loose or sandy soil. Maize does not require to be put in deeper than 3 inches. Care should be taken that the soaked seed is not allowed to dry at all before being covered with the soil after sowing.

The main object in this work is to get a portion of the crop sown as soon as possible, and the bulk sowing of maize should follow immediately. In either early or late sowings of any crop there is always some little risk, and several small sowings are usually better than one large one, unless very favorable weather conditions occur. Every half-acre of barley and tares, or oats and tares, that is sown should supply some 250 feeds of good green stuff, and at least three times this quantity if the crop is of maize. Even a half-acre sowing may thus go far to upholding the milk yield of the herd at a critical time. Such small catch sowings may therefore easily make a big difference in the cash returns of any season.

It is by these successive sowings that the supply of green fodder is well maintained. With such provision herd-testing can reasonably be carried out, and by continuous green feeding the dairy work will be made fully profitable.

PROPAGATION OF ENGLISH HOLLY.

THE common English holly is propagated from seed sown in light soil in pans or boxes, or in sheltered beds in the open ground. The berries are collected as soon as they change colour in May or June, and dried on a tray in the sun. They are then placed in a close-fitting tin, with a dusting of fresh lime on them to keep away seed weevils. The sowing is made as soon as the ground becomes warm again in late spring. The seedlings are transplanted in rows as soon as they are large enough to handle, and planted in their permanent positions when 9 to 12 inches high.

CASSE.

WINE DEFECTS NOT DIRECTLY CAUSED BY MICRO-ORGANISMS.

By F. de Castella, Government Viticulturist.

(Continued from page 490.)

Other Forms of Casse.

As previously pointed out above, there are other forms of Casse besides brown, blue, and white. Critical examination of what is known concerning them is, however, disappointing. We are entering on ground which has been less thoroughly explored, and where much is conjectural. Literature on the subject is scanty, and information somewhat indefinite. There is here a vast field for research work. The following forms are of most importance:—

Potassic Casse.—A curious form of Casse has been described by several French authors, notably Martinand and Laborde, under the above name; a form which is perhaps more frequent than is generally realized in our full-bodied dry red wines, so largely shipped from Australia to England. The points of resemblance of this form to blue Casse, and the reduction of colour and body caused in some wines has been referred to on page 483 of August issue.

Martinand* first drew attention to this defect in connexion with some wines of 1904 vintage, which, though gathered under fine weather conditions, and free from contamination by the Botrytis Cinerea fungus, nevertheless yielded many wines liable to a change not unlike brown Casse.

Analysis of such wines reveals the peculiarity that the ash is more alkaline than the tartaric acid content (free and combined with potash) would lead one to expect; there was thus an excess of potash. An excess too considerable to saturate the acids of the wine capable of displacing tannin from its combinations. Under such conditions the compounds of tannin and colouring matter with potash, have permitted the atmospheric oxygen to combine with the iron contained in the wine, forming sediments of a violet or blackish colour, in the case of wine made from Petit Borschet, and of a yellow colour with Aramon and similar grapes which do not contain much iron.

Such changes are not prevented by heating to 100 deg. C., even if repeated after an interval of 24 hours; hence neither micro-organisms nor enzymes can be the causative agent. Martinand infers that apart altogether from enzymic, bacterial, and aldehydic forms of Casse there exists another alteration, really due to the oxidation of tannin and colour in wines unduly rich in potash.

Such a change is emphasized by the presence of mycoderma vini and M. aceti. It is certainly slower in their absence. Martinand recommends a twofold treatment as follows:—

1. To precipitate the potassic compound of tannin and colouring matter by heavy fining with gelatine or albumen, followed by acidification.
2. To sulphite heavily at vintage time, grapes liable to this trouble.

* *Revue de Viticulture*, 21st September, 1905.

Laborde* corroborates Martinand's earlier observations, agreeing that in wines thus liable, a certain proportion of their tannoid constituents are combined with potash, and in this condition they are more liable to oxidation than in the free state. He refers to the difference between potassic and blue Casse, the wine becoming yellow in the former case.

It must be remembered that the soils of some of our wine districts are remarkably rich in potash—an excess of this element in the wine would thus seem to play a part, not dissimilar from that of the soda one adds to the pyro in a photographic developer; this rough comparison may be permitted in view of the fact that pyrogallol and tannin are kindred substances; the former is, in fact, a derivative of the latter.

Bacterial Casse.—Certain forms appear to be due to bacterial action. Some authorities hold that these organisms can secrete oxydase. Many bacteria produce aldehydes, and it is not clear whether the transformations classed as bacterial casse are due to enzymes or aldehydes. Possibly both play their parts in changes which have been summarily described and not thoroughly investigated. This form constitutes a connecting link between the casse group and wine diseases caused directly by bacteria.

Aldehydic Casse.—The addition of little more than a trace of formol to a normal red wine will immediately induce the symptoms of brown casse, such as clouding, breaking of colour, and the formation of an iridescent surface film. Ethyl aldehyde acts in a similar way, but more slowly and less acutely. Permanganate of potash and other oxydizing agents bring about similar changes.

Aldehydes are normal constituents of wine, especially of old wine. They are also secreted by bacteria and other organisms, notably *Mycoderma vini,* and probably also by the "flor" organism which plays so large a part in the rearing of "fino" sherries. There seems little doubt that aldehydic action plays a large part in the development of wines of sherry, port, and rancio types, possibly a larger part, also, than is generally admitted, in the normal maturation of wines of lighter types.† This phase of the question will be dealt with later.

Mousiness.—This curious and very obnoxious taint, which seems peculiar to Australia, since no similar term exists in any French vocabulary of wine defects, is, in my opinion, of enzymic nature. What the causative agent is, where and how it originates, are problems awaiting solution. Like casse, mousiness only develops on exposure to air. It is also amenable to treatment by sulphurous acid. Distinctly mousy wines treated with SO_2 at the rate of 3 centigrammes per litre usually lose the taint after a few months. It does not appear to be of bacterial origin. I have known pure yeast cultures to become very mousy. These consisted of sterilized grape juice, inoculated with the pure yeast, and which, under the microscope, showed no trace of bacterial or other contamination.

Mousiness is still somewhat of a mystery, the solution of which would be a great boon to Australian wine makers.

* *R. Vit.*, 18th November, 1909.

† See J. Laborde, *R. Vit.*, April, June, July, and August, 1918—Investigations on the ageing of wine.

Normal Maturation of Wine.

In the foregoing pages the relationship between normal maturation and certain manifestations of casse have been referred to. It will not, therefore, be out of place to briefly outline the changes which take place during the ageing of wine.

Since the earliest times it has been known that wine improves with age. Concerning the nature of the changes responsible for such improvement, however, little has been known until comparatively recently. The time which must elapse for the development of the highest measure of quality varies very considerably from a few months in the case of *vin ordinaire,* the household beverage of France, to many decades for a high class Madeira. Claret is usually bottled when five or six years old, and continues to improve for 20 to 30 years according to the vintage. Burgundy matures more rapidly; it is usually bottled when two to three years old, and is at its best seven to ten years later.

There are two distinct stages in the maturation of a wine—cask age and bottle age—to each of which corresponds a distinct class of chemical changes. The first are mainly oxydation phenomena; the second consist in the formation of esters. It is true that esters are also formed in the cask, especially on lengthy storage.

Another fact well known by all cellarmen is that unless kept in vessels which are regularly filled up the wine, especially if light, soon becomes pricked or unsound, ultimately turning to vinegar if exposure be sufficiently prolonged. Air was thus looked upon as the cellarman's greatest enemy.

Prior to 1866, beyond these few facts, little was known on the subject. In that year Pasteur* published his work on wine, the result of two years of research, undertaken at the suggestion of the French Emperor Napoleon III. in 1863.

This remarkable work forms the basis of our present knowledge on the subject. Though later investigators have added to it they have invariably confirmed all that Pasteur wrote more than half a century ago. The ideas then expressed were not only novel, but also revolutionary, since it was shown for the first time that far from air being the enemy of the cellarman it is the main factor in developing the quality of wine. Thus new ideas are set out in the second part of the work under the heading "of the influence of the oxygen of air in wine making."

Pasteur mentions Boussingault's earlier investigations, and his observation that wine contains no dissolved oxygen, but only nitrogen and carbon dioxide, the natural inference being that wine contains highly oxidisable principles. Berthelot confirmed these facts, and was, according to Pasteur, the first to ascribe to its true cause, viz., the absorption of a certain quantity of oxygen, what is known in French as *event,* a word which has no English equivalent, and which means the flatness or staleness (apart from unsoundness), which wine develops on ullage; usually a transient and not a fatal defect. He also quotes Batillat, who in 1846 summed up the then prevailing opinion when he wrote, "There is no good wine in a vessel that is not full."

* L. Pasteur, Etudes sur le Vin, ses Maladies, Causes qui les Provoquent, Procédés Nouveaux, Pour le Conserver et Pour le Vieillir, 1866.

Pasteur explains that he also has studied the relations which can occur between atmospheric oxygen and wine in its different manipulations. He recognises the correctness of the observation of previous investigators and the soundness of several of the practices devised to prevent contact with air, and explains that, "I have, however, been led to view the subject from a new stand-point which I believe is a truer one."

After again quoting Berthelot, who wrote, "My observations prove with what care wine, once it is made, should be preserved from the action of air, since the prolonged action of 10c.c. of oxygen, *i.e.*, 50c.c. of air, suffice to destroy the bouquet of a litre of wine."

Pasteur continues, "But the question is more complex, and I may add, more important than has been thought until now. . . . I have been led to consider this gas (oxygen), not as harmful, but as very useful to wine. According to my view it is oxygen that *makes* wine; it is through its influence that wine ages. It is oxygen that modifies the crude (*acerbes*) principles of new wine, and causes the disappearances of its bad taste; and, further, that provokes sediments of desirable nature in cask and bottle, and far, for example, from an absorption of a few c.c. of oxygen per litre 'wearing' the wine, destroying its bouquet and weakening it, I believe that a wine has not arrived at its quality, and should not be bottled, until it has absorbed a quantity of oxygen much superior to this."

"How explain these contradictory observations? It is necessary to very carefully distinguish between sudden and slow action of atmospheric oxygen on wine. Furthermore, it is not difficult to prove that cellar practices, though seemingly so opposed to the introduction of oxygen into the wine, are eminently suited to submit this liquid to a progressive slow oxydation, whilst at the same time opposing a sudden (brusque) and prolonged aeration. I will even add that, were it not necessary to be constantly armed, in the handling of wine, against the diseases to which it is subject, there are many practices in the art of wine making which would be abandoned because they exclude the oxygen of the air." . . . .

"Even *event* of wine should, itself, be more critically considered than has been done. It is quite true that ullage weakens wine, but I have noticed that this effect changes much with time, if the wine having become flat (*eventé*) is enclosed and kept from contact with air in full bottles. *Event* constitutes thus a kind of change which does not last with anything like its original character, a fact which helps one to realize the great difference which must exist between sudden and slow aeration of wine."

Experiments to determine the gases present in solution in wine are described in detail, the conclusions arrived at being—

"1. That neither new nor old wine contain a trace of free oxygen in solution.*

2. That new wine only contains pure carbon dioxide (carbonic acid).

3. That old wine contains much less carbon dioxide than new wine, and also nitrogen, in appreciable quantity."

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* Only immediately after 24 hours' exposure in a shallow glass dish or after energetic shaking with air does wine contain oxygen in solution. After a day's rest this free oxygen has disappeared. Pasteur, idem, pp. 100 and 108.

Pasteur shows that the presence of flowers of wine (*mycoderma vini*) on the surface prevents the solution of oxygen by the wine, owing to the remarkable avidity for oxygen of this micro-organism. He resumes the question, and points out the advisability of moderate aeration. "We thus see that grape must and wine are very remarkable liquids, considered in their relations with oxygen. They are always exempt of free oxygen, because they are very oxidisable, and consequently always ready to withdraw from air a certain proportion of this gas. It is impossible to expose wine to contact with air without its dissolving oxygen, which soon disappears, so that solution and oxidation can recommence unceasingly."

It is to Pasteur that we owe the explanation of the important part played by the porous envelope constituted by the wood of the cask in the first stage of maturation, that of cask ageing. After pointing out how every cellar manipulation tends, more or less to aerate the wine, he continues—

"But of all these usages, the most considerable from this standpoint is undoubtedly that which consists in storing the wine in casks of oak wood. The walls of a wooden cask permit active evaporation, variable with the thickness of the staves, with the nature of the wine, and, finally, with the cellar, its aspect, its temperature, and the distribution of its air currents. The interior ullage resulting from this evaporation, at the wooden surface, is necessarily replaced by air, the oxygen of which disappears on contact with the wine." The ullage of the cask being known an idea can be formed of the quantity of oxygen absorbed by the wine, even thoroughly bunged and abstraction made of any exposure to air in racking—

Interesting particulars are given of the waste through evaporation in the Burgundy cellars, where the choicest wines are stored, either in large casks or more usually in 228 litre (50 gallon) hogsheads, always of new oak wood. The wine is racked three times the first year (March, May and September), and twice a year during the following two years (June and October) the wine remains in wood on an average four years. The ullage in a 228 litre hogshead is not less than ¾ litre every 25 days in the Burgundy cellars. This applies to the first year during which the new and more porous wood permits more active evaporation; after two years the ullage is reduced to ½ litre per 25 days or 10.5 litres a year. On this basis, during three years storage the ullage would amount to 35.5 litres, equivalent to more than 30cc of oxygen per litre for the three years to which must be added the oxygen absorbed in racking. This is, however, slight in Burgundy cellars, where racking is habitually practised without exposure to air.

Experiments are described which prove "that wine does not age if kept in such a way as to avoid contact with air." The inference is drawn, "That the changes . . . expressed by the term ageing . . . must be mainly attributed to the absorption of oxygen and the liberation of the greater part of the carbonic acid with which the wine is supersaturated at the first racking."

"The use of wooden casks . . . which leads, as shown above, to slow but appreciable aeration . . . is rendered necessary, much more by conditions of ageing of the wine than by the convenience which this class of vessel may present for its storage."

"Impervious vessels of glass or earthenware would be unsuitable. In such the wine would remain 'green' unless very frequently racked."

The question of painting the outsides of casks, a practice followed in some Burgundy cellars, also receives attention. This has a result of keeping

the wine fresher and greener, and I hold that wine stored in such casks should be bottled a year or, perhaps, two years later, other things being equal, than the same wine stored in an ordinary cask.

The proper moment for bottling is of great importance. "Wine must be slowly aerated in order to age it, but the resulting aeration must not be carried too far. It would weaken the wine too much; it would 'wear' it; it would deprive red wine of nearly all its colour. There thus exists a moment variable for each sort of wine (and for the same sort with the vintage) at which the wine should pass from a porous to an almost impervious vessel."

It is not possible to here describe the now classic experiments with wines in sealed tubes with and without exposure to air, in darkness and in sunlight. In sealed tubes without air no maturation took place. On the contrary, striking changes occurred when aeration was abundant (sealed tubes only half full). "The wine finally losing its original flavour, ageing beyond measure, and developing in an extreme degree, the taste of Rancio wines, in the case of a red wine or a Madeira taste in that of a white wine."

The flatness (*event*) resulting from aeration, if not pushed too far is, however, temporary. If the wine be subsequently kept in full-sealed vessels considerable changes occur, usually favorable to quality. The full influence of oxygen is not immediate. "The first influence of oxygen is not the durable influence; it is not that which will be observed after a certain time if the wine is preserved from further oxidation. Thus is certainly explained the need to allow newly bottled wine to rest before its quality can be judged."

In these sealed tube experiments, aeration was more drastic than under normal cellar conditions. "A few weeks exposure to air and sunlight produced the action of ten to twenty years in cask. Naturally a wine, aged and caused to develop a bouquet thus rapidly, has not the identical quality of a wine matured 20 or 30 years in cask; nevertheless the changes are of similar nature." I repeat, all these profound changes which it takes ten to twenty years to obtain in Jura, and two or three years at Cette, can be brought about in some weeks by the direct effect of atmospheric oxygen.

"The combination of oxygen with wine is thus, it seems to me, the essential act in the ageing of wine."

Before leaving the subject Pasteur deals with the well-known action of a sea voyage in maturing a wine—"I am persuaded that the changes must be attributed far more to the action of oxygen than to increase in temperature. Two circumstances favour the introduction of oxygen during a voyage to the Indies or to America: more rapid evaporation at the surface of the staves, and especially the shocks of the liquid against the walls (sides of the cask) acting less by agitation than as the cause of sudden and unceasingly repeated variations in internal pressure, whence result an expulsion of nitrogen and carbonic acid, and an entry of air through the pores of the wood, far more active than in case of a wine being left at rest in a cold cellar."

Though Pasteur made it perfectly clear that maturation of wine, especially in the cask, is essentially an oxidation process, he is less definite concerning the substances which are thus oxidized. Colouring matter is, however, frequently mentioned. Thus on page 82, "There

exist in grape must . . . principles as yet imperfectly known which have extreme avidity for oxygen, and which combine directly with it. These principles are certainly multiple, already in must, and *a fortiori* in wine, where are to be found, in addition, the colouring matter of the skins, itself very avid of oxygen.

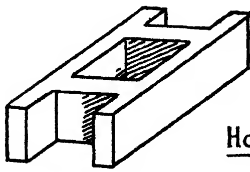
Again (page 118) dealing with the behaviour of wine in half-filled sealed tubes. "Though the colouring matter of red wine and a similar matter in white wine, feel the effects of oxygen in most marked manner, it must not be thought that oxygen does not also act on other principles. The phenomenon is most complicated. I have noted in tests, several times repeated, that part of the acid seemed as though burnt." A case is mentioned of a wine which thus lost 12 per cent. of its total acidity. Sugar seemed to undergo a similar reduction. "Interesting studies might be made in these directions."

(*To be continued.*)

CONCRETE BLOCKS FOR BUILDING PURPOSES.

The advantages claimed for this form of building material are—

1. Cheapness compared with other fireproof building material.
2. It is possible to make blocks in almost any shape.
3. Good insulation (hollow blocks).
4. Low labour cost. Blocks are laid rapidly and with less mortar than bricks.
5. It is claimed that properly constructed walls of concrete blocks are stronger than walls of equal size made of brick or stone.



Good Type of Hollow Block

MANUFACTURE OF BLOCKS.

A fine aggregate and a rather rich mix are required for satisfactory work.

In solid blocks it is permissible to use aggregate up to 2 inches or 2½ inches, provided sufficient finer aggregate is used also.

In hollow blocks, the thickness of the wall is seldom greater than 1½ inches, therefore aggregate from ½ inch to ¾ inch should be used.

To prevent ingress of moisture rich, dense mixture should be used.

Interior partition walls may be made of leaner mix and, if available, cinders may be used instead of stone aggregate.

For exterior walls gravel or broken stone should be used.

Where sand only is used for the aggregate, the mixture may vary from 1 to 3 to 1 to 6 (that is one part of cement to from 3 to 6 parts of sand).

When stone and sand are used, the proportions should be 1, 2, 4, or 1, 3, 5 (1 cement, 3 sand, 5 stone).

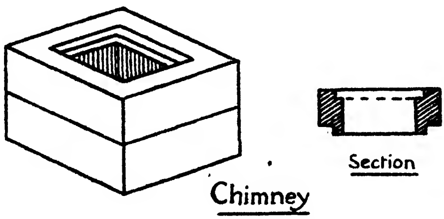
There are three methods of making the blocks.

1. *Tamping.*—A dry mix is used. Placed in mould and tamped. Then, when sufficiently hardened, the block is removed and stored under cover until cured. The blocks *must* be kept moist and protected from sun, wind, and frost until thoroughly cured. The blocks should be covered with wet bags, and the bags moistened from time to time for a fortnight. This curing must not be neglected, as often an entire wall has failed through the failure of one or several of the blocks.

2. *Pressing.*—When blocks are pressed, the mixture should be more moist. The blocks should be cured as above.

3. *Moulded.*—A wet mix is used and the blocks are left in the mould for several hours. Curing is necessary.

Sometimes blocks are moulded "face" downwards. The bottom layer may be made of rich mix and a backing of leaner concrete used. Thus a waterproof face is obtained.



ADVANTAGES OF SOLID BLOCKS.

Hollow blocks undoubtedly have advantages over solid blocks—

1. Insulation.
2. Lighter to handle.
3. Saving of material.

Special chimney blocks may be made as in sketch.

Laying.—Concrete blocks should be laid with as thin mortar joint as possible. Cement mortar 1 to 2 or 1 to 2½ should be used.

Sufficient blocks should be prepared before commencement of work. Special blocks for window sills, &c., should be prepared in advance.

A footing for a foundation wall is necessary as with a brick building.

Plastering may be done directly on inside face of blocks. If the blocks are porous this is not advisable. In this case furring strips are used, and the usual lath and plaster method adopted.

Walls for one-story building are usually made 8 inches thick.

LIME CONCRETE BLOCKS.

The use of lime concrete for the blocks is not to be recommended. Lime mortar bricks have seldom given satisfaction, owing to their lack of strength and to their porosity. The difficulty of rendering them waterproof should be considered.

Screened gravel is to be preferred to limestone for the aggregate, but the latter should prove satisfactory. In the absence of samples this cannot be definitely stated.

It is most important that the sand and aggregate should be clean and free from impurities, and that clean fresh water should be used for mixing.

WORLD'S POULTRY CONGRESS.

(Continued from page 436.)

By A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

Polyneuritis Among Fowls.

Professor Dr. L. De Blieck dealt with this trouble, explaining that so far as fowls were affected this was generally due to a deficiency of vitamines. The symptoms were similar to those of beri-beri in man. The symptoms usually noted are, first—ataxia—the animal walks briskly, but particularly when changing direction slips sideways, the walk gradually becomes spasmodic, paralysis increases, and vitality rapidly declines. A dose of from 1 to 2 grammes of yeast is considered to be the best possible treatment, and the trouble is usually found to occur amongst birds closely cooped up in the neighbourhood of towns.

Abscess of the Feet in White Leghorns.

Dr. B. F. Kaupp, of North Carolina, described the trouble commonly known as "bumble-foot" as being most prevalent amongst "the more delicate breeds, as the leghorns." In all cases investigated a pure culture of a similar organism was obtained, *i.e., Staphylococcus pyogenes aureus.* Bruising the soles of the feet, as by jumping from perch to floor favours abscess formation when the pus-producing organisms are present. Lancing the abscess, and curetting out the cheesy pus, followed by swabbing the cavity with pure iodine is found to be the most successful treatment.

Vaccines for Poultry.

Dr. Camillo Ferni pointed out that Pasteur's original experiments were made on the bacillus of chicken cholera by weakening the virulence through the action of atmospheric oxygen, so as to produce an inflammatory local reaction at the spot of inoculation where the bacilli possessing a reduced virulence, multiply while invading a part of the tissues, but are at the same time attacked and destroyed by the phagocytes before having determined the general infection. When the local inflammatory process is cured, the fowls remain immune from the lethal dose of a virulent culture. Pasteur's method for the vaccination of fowls against chicken cholera remains the classical process with which a permanent immunity for two years or more is assured. The inoculation is done with an ordinary syringe under the skin at the spot where the neck joins the back.

What is being done to Improve the Poultry Industry in Various Countries.

The Fourth Section of the Congress dealt with the training and necessary qualifications of poultry instructors, education, and demonstrating work. In Great Britain, Europe, and America regular courses

in poultry culture are held for the purpose of training future instructors, examinations are held, and diplomas or certificates issued. The first college professor of poultry culture at an American college was appointed in 1906, the salary being 2,500 dollars a year. Forty-two out of the 48 States in America now offer poultry instruction at their State colleges or universities.

In Great Britain the practice has been for the various county councils to employ an itinerant lecturer, at first on the basis of a fee per lecture, or series of lectures. Later on, some of the agricultural teaching institutions began to provide more or less regular instruction in poultry keeping, and by degrees small poultry plants commenced to make their appearance at the agricultural teaching institutions.

The supply of competent teachers was extremely small. Not only had there been no training school to provide teachers, but there had been no experimental or investigation work done upon which to base teaching. In view of lack of trained teachers, the Board of Agriculture in 1894 organized a course of poultry instruction at Leeds University, and in the same year University College, Reading, commenced to provide instruction. In 1899 the first poultry training and experimental station was established at Theale, near Reading, by Mr. Edward Brown. Short courses of three weeks' study were gradually extended in 1901 to ten weeks, and by 1907 they were further extended to twelve months' duration. In thirteen years over 500 students had undergone training, coming from practically all parts of the world.

At the present time 51 county councils employ 57 whole or part time instructors, who secure an average attendance of about 35 persons per lecture. Seeing that in 1919 Great Britain imported eggs and poultry to the value of £35,000,000, the necessity for poultry instruction is obvious.

A national poultry council has now been formed, and a national diploma in poultry keeping is now being awarded by examination on similar lines to the national diploma in agriculture and the national diploma in dairying.

Education in poultry keeping has been provided for over 20 years. Ireland is essentially a country of small farms. Out of a total of 572,000 holdings, some 400,000 are of not more than 30 acres in extent, and of this number 114,000 are of not more than 1 acre. People who are willing to keep a pure breed of fowl, say, 30 hens and three males, and are willing to distribute therefrom 70 sittings of eggs in the year are given a grant of £9.

There is also an Irish national egg-laying competition for pens of six pullets, the average number of eggs per bird in 1913 being 120, rising in 1920 to 186 eggs per bird. The profit over feed per bird in 1913 was 5s. 7d., and in 1920 was 34s. 5d. Twenty years ago the total value of the poultry industry in Ireland was less than £4,000,000. Now it is worth no less than £24,000,00, as compared with under £10,000,000 for butter and cheese, and about £8,000,000 for pigs, bacon, and hams.

STALLION REGISTER, 1922-23,

under the "Horse Breeding Act 1919."

(Part I.—Registrations prior to 12th July, 1922.)

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
122	Abbot's Pride ..	A	Draught ..	W. H. Gadd ..	"The Glen," Wodonga
574	Aberdeen	A	Light ..	John Troup ..	Coghill's Creek
12	Ace of Spades ..	A	" ..	C. Lippiatt ..	Scotsburn
575	Active	A	Thoroughbred	G. Brown ..	Bennison
192	Admiral Speary ..	A	Draught ..	C. Hill ..	Gama
156	" Sperry ..	A	" ..	A. Duff ..	Baringhup
188	" Wood ..	A	Light ..	A. G. Hunter ..	Elmore
290	Advance	A	Draught ..	A. W. Brown ..	Speed
509	Aird Laddie ..	A	" ..	E. Yeaman ..	P.B., Echuca
366	Albert Dale ..	4	" ..	Vaughan Bros. ..	524 Collins-st., Melbourne
69	Albion	A	" ..	Jas. Oakes ..	Nathalia
70	Al Borak	A	Light ..	L. Bennett ..	Nullawil
317	Alex. R.	A	" ..	C. L. Lutze ..	Long Plain, *viâ* Sea Lake
103	All Black	A	" ..	W. Morey ..	Katandra Nth.
510	" Scotch ..	7	Draught ..	Elliott and Dickens	Corowa, N.S.W.
104	" Style	A	Light ..	R. Matchett ..	Bendigo
511	Almont M. ..	A	" ..	J. Minns ..	Melton
13	Almont's Pride ..	A	" ..	Downie Bros. ..	Longwarrys
576	Ambershine ..	A	" ..	L. A. Gunsser ..	Ballarat
14	Amberstain ..	A	" ..	J. L. Cumming ..	Borrimal
577	Angle Jack ..	A	" ..	C. F. Hillas ..	Tallangatta
439	Argyle	A	Pony ..	R. Trimble ..	Rutherglen
440	Astor	A	Light ..	A. Grant ..	Meredith
388	Attractions Champion	A	Draught ..	W. Morley ..	Rutherglen
318	Avonlea	7	Draught ..	Jas. Leitch ..	Wodonga W.
15	Axedale Prince ..	6	"	J. McDonald ..	Barrakee N.
242	Bally Bells ..	4	Light ..	N. W. Clements..	Baxter
16	" Golly ..	A	Pony ..	T. C. Maidment ..	Moyston
349	Bannockburn ..	A	Draught ..	G. W. Francis ..	Lower Norton
291	Barney II. ..	A	Pony ..	A. W. Thomson ..	Hamilton
71	Baron	A	Draught ..	M. Murphy ..	Rupanyup
449	" Asquith ..	A	" ..	J. Hall ..	Jamestown, Sth. Aus.
2	" Belmain ..	3	" ..	L. J. King ..	Quambatook
72	" Clyde ..	A	" ..	Cunnington Bros.	Bamawm
436	" Crombie ..	5	" ..	A. P. Johnston ..	Colbinabbin
513	" Faithful ..	A	" ..	D. Barry, junr. ..	Culgoa
508	" Favourite ..	4	" ..	W. Bodey ..	Dooen
194	" Fenwick ..	A	" ..	H. C. Wilson ..	Raywood
452	" " ..	A	" ..	A. J. Richards ..	Strath Creek
248	" Gleniffer ..	6	" ..	S. J. Lynn ..	Orbost
441	" Juno ..	A	" ..	Manifold and Co.	Camperdown
249	" Laddie ..	A	" ..	A. McLennan ..	Darrinal
195	" Leigh ..	A	" ..	Meer Khan ..	Modewarre
296	" McKie ..	A	" ..	J. A. McDougall	Cosgrove
580	" McLeod ..	A	" ..	David Mitchell Est.	Lilydale
514	" Milford ..	A	" ..	Jas. Johnstone ..	Lubeck

STALLION REGISTER, 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
578	Baron's Heir ..	A	Draught ..	T. J. Hansen ..	Barnawartha
515	„ Idol ..	A	„ ..	J. Carmichael, jun.	Burramine N.
17	„ Pride ..	A	„ ..	V. J. Lanfranchi	Cowangie
196	„ Reserve ..	A	„ ..	E. J. McCabe ..	Gerang
197	„ Royal Chief	A	„ ..	T. E. Parry ..	Coonooer Bridge
389	Baron Stanley ..	A	„ ..	Graham Bros. ..	Bacchus Marsh
73	„ Stewart ..	A	„ ..	J. W. Hansen ..	Baulkamaugh
					North
3	„ Style ..	4	„ ..	A. J. A. Browne	Werribee
198	„ Twist ..	A	„ ..	E. W. and W. S.	Pannoobamawm
				Ham	
442	„ Watson ..	A	„ ..	Manifold and Co.	Camperdown
443	„ Weerite ..	6	„ ..	Manifold and Co.	Camperdown
74	„ Wigton ..	A	„ ..	Dept. of Agric.,	Werribee
				State Research	
				Farm	
18	Barony	A	„ ..	G. McVicar ..	Avoca
579	Battarlons ..	A	Light ..	T. Skelly, jun. ..	St. Arnaud
159	Bawnmoor ..	A	Thoroughbred	Jessa Singh ..	Nyarrin
453	Bay Harold ..	A	Light ..	A. Sutherland ..	Boneo
199	Beaconsfield Flyer ..	A	„ ..	T. J. Scott ..	Everton
193	Beau Brummel ..	A	„ ..	John Scott ..	Neilborough
516	„ Cheval ..	A	„ ..	T. Garland ..	Sandy Creek
160	„ Gallant ..	A	„ ..	J. Dunlop ..	Birregurra
251	Belmont's Champion	A	Draught ..	Goss Bros. ..	Donnybrook
500	Berkeley Bantam ..	A	Pony ..	R. Crozier ..	South Morang
202	Bismarck ..	A	Light ..	H. J. Manthorpe	Inglewood
255	Black Prince ..	A	Pony ..	Thos. Gaudie ..	Thoona
390	Black Tom ..	A	Light ..	A. Potter ..	Narrghid
146	Blue Wilkes ..	A	„ ..	J. McNeill ..	Weering
252	Bobby	6	Pony ..	Geo. Officer ..	Woolsthorpe
319	Bobniak	A	Light ..	H. F. Clarke ..	Miepoll
321	Bold Acton ..	A	Draught ..	E. Pearce ..	Rupanyup
581	„ Agitation ..	A	„ ..	Chamberlain and	Morwell
				Ritchie	
295	„ Briton ..	A	„ ..	C. A. Schulz ..	Lake Hindmarsh
7	„ Captain ..	3	„ ..	T. Parker ..	Pepper Plains
584	„ Lad	A	Pony ..	J. W. Smith ..	Elmore
367	„ MacGregor ..	A	Draught ..	W. McNaughton	Walpeup
454	Bonnie Direct ..	A	Light ..	W. T. Taylor ..	Merbein South
392	„ Brae ..	A	Draught ..	King Bros. ..	Kinnabulla
369	„ Doon Junior	A	Pony ..	A. E. Davis ..	Omeo
588	„ Wizard ..	A	„ ..	J. Fitzpatrick ..	Numurkah
256	Bon Wickliffe ..	A	Light ..	J. Ford ..	Wickliffe
75	Bower Bank ..	A	„ ..	J. O'Bree ..	Piangil
322	Bramhope Forester	A	Draught ..	E. Parish ..	Horsham
455	„ Monarch	A	„ ..	G. Hicks ..	Miram
19	„ Paladin	A	„ ..	W. H. Alford ..	Modewarre
393	„ Parthian	A	„ ..	C. L. Renfrey ..	Drysdale
162	„ Samson	A	„ ..	A. Dean ..	Tinamba
456	Breastknot ..	A	„ ..	W. J. Moll ..	Dimboola
457	Brecknock ..	A	Pony ..	R. Hentschel ..	Maindample
517	Brigham Again ..	6	„ ..	J. H. Hindhaugh	Weerite
203	Bright Star ..	A	„ ..	J. J. Simkin ..	Chetwynd
370	Briton's Pride ..	A	„ ..	G. Kenworthy ..	Ballarat
258	Bronte's Pride ..	6	„ ..	J. V. Hosking ..	Towaninnie
518	Bronzewood ..	A	Thoroughbred	Quinlan Bros. ..	Oaklands Junct.

STALLION REGISTER, 1922–23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
458	Buchlyvie's Choice ..	A	Draught ..	W. J. Westendorf	Winiam
394	Bundoran ..	A	Light ..	A. Graham ..	Bacchus Marsh
185	Bundoora Black Leigh	5	Light ..	Miss B. B. Reid ..	Bundoora
351	Bute Laddie ..	A	Draught ..	Crawford Bros. ..	Tatura
520	Cacique	A	Thoroughbred	J. H. Templer ..	Nhill
253	Calais	A	"	Geo. Officer ..	Woolsthorpe
371	Caledonia	A	Draught ..	Withers Bros. ..	Bobinawarrah
332	Camperdown, late Friar John	A	Pony ..	Miss N. McKellar	Geelong
107	Canberra	A	Draught ..	C. Bowland ..	Gunbower
20	Cannonite ..	A	Pony ..	Exors. J. C. H. Graves	Mansfield
521	Cape Sky ..	A	Thoroughbred	G. Buckley ..	Wickliffe
506	Captain Throave ..	4	Draught ..	A. S. H. Schroeter	Bute, Sth. Aust.
76	Captain White ..	A	Thoroughbred	R. Gilder, jun. ..	Sale
327	Carman	A	"	J. W. P. Prendergast	Benambra
108	Carwelkin ..	A	Light ..	T. Spillane ..	Williamstown
21	Cathedral Chimes ..	A	" ..	A. B. Carter ..	Guildford
522	Cedric	A	Draught ..	S. L. Moodie ..	Warracknabeal
200	Chal	6	Thoroughbred	T. J. Scott ..	Everton
259	Champion of Kelmscott	6	Draught ..	W. H. Robinson	P. B., Kerang
589	Chief Justice ..	A	Pony ..	O. W. Fisher ..	Morgan's Bridge
77	Cicero	A	Draught ..	R. Lloyd ..	Kyabram
573	Claredon	A	Pony ..	Bennett Bros. ..	Coleraine
123	Clarey	A	" ..	Jno. Jones ..	Mywee
524	Clarion	A	" ..	W. H. Thompson	Yalca
11	Claymore	A	" ..	J. P. Hanrahan ..	Ballan
459	Clem	A	" ..	N. Cole ..	Camperdown
352	Clyde Boy ..	A	Draught ..	H. Goldsmith ..	Corack
526	" Laddie ..	A	" ..	J. Alexander ..	Caniambo
527	Cock Robin ..	A	" ..	W. Studman ..	Lucknow
528	" " ..	A	" ..	A. D. Redenbach	Tambo Upper
353	Coliban	A	" ..	Wm. Todd ..	Taradale
260	Colonel Dale ..	A	" ..	T. F. Major ..	McMillans
395	" Garfield ..	A	" ..	C. Howard ..	Elliminyt
78	Come More ..	A	Pony ..	C. H. West ..	Buchan
444	Commodore Nut ..	A	" ..	Manifold and Co.	Camperdown
161	Commonwealth ..	A	Light ..	S. Mathieson ..	St. Helen's Plains
591	Congress	A	Pony ..	J. Reid ..	Warrion
529	Contractor ..	A	Light ..	J. T. Ovens ..	Cooma
531	Coronation Day ..	A	Pony ..	H. W. Atkinson ..	Gritjurk
592	Cosmopolitan II. ..	A	Light ..	Wade Bros. ..	Glen Alvie
79	Craigieburn Premier	6	Draught ..	P. Rentsch ..	Croxton E.
593	Creeper	6	Pony ..	F. A. Brown ..	Rosedale
594	Crest of the Wave ..	A	Thoroughbred	F. Hender ..	Franklinford
204	Crown Jewel ..	A	Draught ..	Kuhne Bros. ..	Rainbow
460	Crown Steel ..	A	Thoroughbred	J. Sharp ..	Minyip
595	Culloden	A	Light ..	A. Millard ..	Yaapeet
372	Cyndett II. ..	A	Pony ..	G. J. Marshall ..	Burnley
247	Dalcampbell Cleve ..	5	Light ..	C. E. Baker ..	Brunswick W
22	Dalmeny	A.	Draught ..	A. J. Ritchie ..	Arawata
109	Dalmore	A	" ..	H. Woods ..	Bangerang
205	Dalyston (late Panic)	A	Light ..	J. Kortright ..	Lara
124	Dan Again ..	A	Draught ..	C. I. Dunster ..	Willaura

STALLION REGISTER, 1922–23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
596	Dan Bells	A	Light ..	H. G. Gregerson	Benalla
328	Dandy	A	Pony ..	P. Purves ..	Rosebud
80	„ Dick ..	A	„ ..	L. Bennett ..	Nullawil
373	„ Duke ..	A	„ ..	Kong Meng Bros.	Longwood
206	„ Junior ..	A	„ ..	R. Withers ..	Bobinawarrah
355	„ Lad ..	A	„ ..	Stuckey Bros. ..	Flynn's Creek
207	„ „ ..	A	„ ..	A. C. Head ..	Mansfield
532	Dandy's Pride ..	A	„ ..	P. V. Frauenfelder	Wodonga
461	Dandy Style ..	6	„ ..	S. R. Lobb ..	Nagambie
139	Danedite	A	Draught ..	P. Gardiner ..	Carlisle River
110	Darling's Comet ..	6	„ ..	Brock Bros. ..	Moe
24	Deck Top ..	6	Light ..	Mackin Bros. ..	Korong Vale
210	Decorator ..	A	Pony ..	F. E. Jennings ..	Inglewood
239	Delavan	A	Light ..	M. E. McMurtrie	Albert Park
261	Demo Dick ..	A	Light ..	A. E. Nuske ..	Kewell
262	Demolition ..	A	Thoroughbred	A. R. Link ..	Kaniva
519	Detonator ..	A	Pony ..	Quinlan Bros. ..	Oaklands Junct.
254	Dibdale	A	Thoroughbred	Geo. Officer ..	Woolsthorpe
462	Dick Alto	A	Light ..	W. J. Banner ..	Irymple
597	Digger	A	„ ..	R. Dunbar ..	Harston
329	Digit Alto ..	A	„ ..	E. D. Cuthbert ..	Camperdown
504	Dillon Bell ..	A	„ ..	S. J. Lewis ..	Baringhup
81	Direct Argot ..	4	„ ..	R. Matchett ..	Bendigo
501	„ Harry ..	A	„ ..	J. Rousch ..	Cohuna
263	Director	A	„ ..	H. T. Lummis ..	Murphy's Creek
105	Directway.. ..	A	„ ..	R. Matchett ..	Bendigo
238	Don Abbey ..	A	„ ..	M. E. McMurtrie	Albert Park
396	Donald	A	„ ..	Rosetta Bonney	Woomelang
25	„	A	Pony ..	G. H. Whitehead	Minhamite
533	Druce	A	Light ..	Joe Holt ..	Wycheproof
397	Drum Laddie ..	A	Draught ..	A. E. Barker ..	Kyabram
26	Drummond King ..	A	„ ..	H. and G. Holland	Piavella
498	Drysdale	A	„ ..	W. Crozier ..	South Morang
598	Duddon	A	Thoroughbred	E. W. Dixon ..	Cowes, Philip Is.
356	Dundonald's Chief ..	A	Draught ..	H. Doherty ..	St. James
297	Dunsby's Pride ..	A	„ ..	J. R. Baldwin ..	Gre Gre Village
163	Earlmont	A	Light ..	A. J. Snow ..	Stanhope
264	Echelon	A	„ ..	H. T. Nicholas ..	Thornton Lower
82	Electioneer ..	A	„ ..	G. J. Shaw ..	Yarram
534	Emulator's Pride ..	A	„ ..	W. McArthur ..	Noorat
36	Ercildoon Dick ..	A	Pony ..	D. Gardner ..	Milawa
113	Expectation ..	A	Light ..	W. P. Lawlor ..	Coldstream
400	Fairhaven	A	Draught ..	P. Smith ..	Mingay
164	Fashion Direct ..	A	Light ..	R. W. Zirkler ..	Kerang
599	Fashion's Model ..	A	Draught ..	A. B. Hamilton ..	Fish Creek
401	Fast Time.. ..	A	Pony ..	J. Nevett ..	Toolamba
165	Fatty Arbuckle ..	6	Draught ..	Jas. Mills ..	Bangerang N.
211	Federal Prince ..	A	„ ..	Geo. Luckie ..	Springhurst
213	Federation ..	A	Pony ..	A. Wilson ..	Cororooke
214	Fidelio	A	Thoroughbred	T. H. Smith ..	Lalbert
5	Finnimore.. ..	5	„	Jas. Brown ..	Natimuk
586	First Voyage ..	A	Light ..	Busst Glasheen ..	Huntly
83	Fitzallan	A	Draught ..	S. V. Vaughan ..	Nyam
402	Flash Donald ..	A	Light ..	John Morris ..	Curyo
535	Flash Jack ..	A	Draught ..	P. McIntyre ..	South Cannum
450	Flowerdale ..	A	„ ..	H. Ledger ..	Pinnaroo, S.A.
374	Foreigner	A	Pony ..	C. Ferrari ..	Devondale

Stallion Register, 1922–23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
331	Fred	A	Draught ..	A. Dunning ..	Numurkah
536	Freedom	A	Light ..	E. W. Roscoe ..	Goorambat
298	,, ...	A	,, ..	J. Montgomery ..	Milawa
147	Free Scot	A	,, ..	T. Robertson ..	Macarthur
89	Futurist	A	Pony ..	E. Allan ..	Ondit
375	Gallant Lad ..	A	Draught ..	C. T. Weir ..	Yaapeet
148	Garfield Junior ..	A	Pony ..	T. Robertson ..	Macarthur
27	General Harvey ..	A	Draught ..	Koschitzke Bros.	Bangerang
463	,, Keith ..	A	,, ..	C. S. Walker ..	Swan Hill
403	,, McDonald	A	,, ..	W. Pacholli ..	Mysia
404	,, Scott ..	A	,, ..	A. Strawhorn ..	Edgecombe
106	Gentleman Jack ..	A	Light ..	R. Matchett ..	Bendigo
35	Glengarry	A	Pony ..	A. R. Dalton ..	St. Kilda
9	Glenlea	A	Draught ..	A. F. Smith ..	Nypo
405	Glenmarkie ..	A	,, ..	W. Lunn, jun. ..	Romsey
333	Glenmore	A	Light ..	J. F. Prankerd ..	Gillingall
406	Glenscott	6	Draught ..	P. McNeil ..	Kyneton
334	Glyn Trustful ..	A	Pony ..	Roth Bros. ..	Ensay
28	Gold Coin	A	Draught ..	A. E. Cummings	Berrimal
215	Golddust	A	Light ..	W. E. Maybery ..	Nurcoung
537	Golden King ..	A	,, ..	H. Neary ..	Bowman's Forest East
571	Goldenwood ..	A	,, ..	J. T. Ovens ..	Cooma
512	Goldie	A	,, ..	W. J. Minns ..	Melton South
29	Gossoon Bells ..	A	,, ..	Wm. Leach ..	Rheola
538	Grand March ..	A	Draught ..	W. M. Hughes ..	Inglewood
585	,, Voyage ..	A	Light ..	Busst and Glasheen	Huntly
265	Grattan Junior ..	A	,, ..	W. J. Parish ..	Horsham
587	Gratton's Voyage ..	A	,, ..	Busstt and Glasheen	Huntly
30	Grey Marvin ..	A	,, ..	J. S. W. Uren ..	Krowera
299	Guy Tod	A	,, ..	W. Williams ..	St. Arnaud
114	Gypsy Hero ..	A	Draught ..	O'Neill and Son ..	Nathalia
31	Hafren Sensation ..	A	Pony ..	Miss B. B. Reid ..	Bundoora
115	Halcyon	A	,, ..	Mrs. J. M. Maclellan	Windsor
464	Hamboltonian Direct	A	Light ..	R. S. Wright ..	Yarrabert
32	Hames	A	,, ..	Thos. Dean ..	Cann River
320	Handyman ..	A	Thoroughbred	H. F. Clarke ..	Miepoll
33	Happy Jack ..	A	Pony ..	J. B. Atchison ..	Southern Cross
84	,, Vein ..	A	Thoroughbred	Fitzpatrick Bros.	Boort
85	Harmattan ..	A	,,	C. Tobin ..	Eskdale
216	Harry Almont ..	A	Light ..	S. Pemberton ..	Wedderburn
157	,, Alto ..	A	,, ..	A. G. Hunter ..	Elmore
158	,, Rose ..	A	,, ..	A. G. Hunter ..	Elmore
399	Hayston	A	Thoroughbred	A. E. Barker ..	Kyabram
4	Hazel's Elect ..	3	Light ..	F. E. Watts ..	Sandringham
335	Heather King ..	A	Pony ..	M. W. Dwyer ..	Merino
116	Hermes of Shetland Heights	A	,, ..	Mrs. J. M. Maclellan	Windsor
34	Hero II.	A	,, ..	Greaves Bros. ..	Yannathan
217	Hiawatha of N.Z. ..	A	Draught ..	Waldron Bros. ..	Chinkapook
218	High Degree ..	A	,, ..	Schroeder Bros. ..	Murrayville
166	High Honor ..	A	,, ..	C. H. Feldtmann	Major Plains
465	Highland Boy ..	A	,, ..	S. E. Moss ..	Quambatook
357	,, Cleve ..	A	Light ..	M. L. V. Greatz ..	Irymple

STALLION REGISTER, 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
167	High Tide ..	6	Draught ..	J. McEncroe ..	Perth, W.A.
336	,, Fancy ..	A	,, ..	G. Hildebrand ..	Leitchville
266	Hillhead Knight ..	A	,, ..	R. E. Krause ..	Boolite
408	Honest Wilks ..	A	Light ..	H. D. Adams ..	Kotupna
407	Hoprig	A	Thoroughbred	R. F. Carmody ..	Everton
125	Hotspur	A	Pony ..	Z. L. Small ..	French Island
8	Hullabaloo ..	A	Light ..	H. Brooks ..	Waitchie
409	Imperial Crown ..	A	,, ..	T. G. Maher ..	Purnim
267	Invincible ..	A	Draught ..	J. F. Ryan ..	Bearii P.O.
219	Ipidi	A	Thoroughbred	J. O'Keefe ..	Shepparton
136	Ironsides	5	,,	A. Crozier ..	Brighton
337	Jack	A	Pony ..	P. Lawrie ..	Rushworth
168	Jack Annandale ..	A	Light ..	A. O. Foster ..	Maffra
466	,, Smith ..	6	Draught ..	S. Maddern, jun.	Leongatha
539	James Osterley ..	A	Light ..	A. Huddleston ..	South Geelong
540	J.N.S.	A	,, ..	Wilson Bros. ..	Swan Hill
541	Jock	A	Draught ..	G. T. Wolstenholm	Milawa
502	John Marvin ..	4	Light ..	John Rousch ..	Cohuna
189	Jolly Maltster ..	A	Thoroughbred	Defence Dept. ..	Melbourne
542	Kelm Pride ..	A	Draught ..	C. Lippiatt ..	Scotsburn
543	Kelm's Best ..	A	,, ..	J. Bright ..	Mirboo
467	Kilburnie	A	,, ..	A. E. Whitfield ..	Marong
350	King Albert ..	A	,, ..	G. Francis ..	Horsham
376	,, Almont ..	A	Pony ..	John Clarke ..	Mortlake
220	,, Ballance ..	A	Draught ..	F. H. Kennett ..	Kaniva
544	,, Bee	A	Pony ..	W. T. McAlpine ..	Hopetoun
86	,, Clyde ..	A	Draught ..	E. D. Scown ..	Terang
221	,, Duncan ..	A	,, ..	P. Leydon ..	Cooma
410	,, Jimmy II. ..	A	Pony ..	R. H. Larcombe	Mt. Moriac
38	,, of the Kings ..	A	Draught ..	T. Christie ..	Woodend
414	,, of the Roses II.	6	,, ..	M. McGillivray ..	Bald Rock
415	,, of the Shepherds	A	,, ..	E. R. Campbell ..	Nypo
411	,, Osterley ..	A	Light ..	J. M. Fahey ..	Gnotuk
377	,, Osterley A ..	A	,, ..	G. Anderson ..	Newtown, Glng.
545	,, Owyhee ..	A	,, ..	W. Barkmeyer ..	Koondrook
546	,, Wilks ..	A	,, ..	J. Bright ..	Mirboo
39	King's Treasure ..	A	Thoroughbred	G. Ritchie ..	Delatite
268	Kinloch	A	Draught ..	W. Hicks ..	Miram
468	Kitchener	A	,, ..	Dookie Agricultural College	Dookie
300	Knight Royal ..	A	,, ..	J. D. Moran ..	Carron
446	Kola Mauritius ..	A	Light ..	J. Sullivan and Sons	North Melbourne
338	Laddie O'Groat ..	6	Draught ..	L. J. King ..	Quambatook
358	Laird Again ..	A	,, ..	P. Davey ..	Miner's Rest
301	,, of Selkirk ..	A	,, ..	Wm. Troy ..	Myall
505	Lancashire Lad ..	5	,, ..	W. Robertson ..	Armstrong
140	Larrakin	A	Light ..	H. Sutherland ..	Chinkapook
469	Latest Style ..	A	,, ..	T. Buckley ..	Romsey
547	Lee Creek Squire ..	A	Draught ..	A. K. Lange ..	Armytage
40	Leevialand ..	A	Light ..	A. Bickley ..	Trafalgar
269	Lena's Abbey ..	A	,, ..	W. C. Greaves ..	Monomeith
323	Le Rosier	A	,, ..	E. Parish ..	Horsham
270	Light O'Frisco ..	A	,, ..	J. H. Lucas ..	Macarthur
41	Linkwood	A	Draught ..	W. J. Jenkin ..	Willaura
42	Lion Prince ..	A	,, ..	J. F. Hurley ..	Bobinawarrah
416	Little Bill	A	Light ..	A. T. Corner ..	Fosterville

Stallion Register, 1922–23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
87	Little Billy ..	A	Pony ..	C. Pratt ..	Watchupga
470	,, Comet ..	6	,, ..	T. McNally ..	Seymour
271	,, Jim ..	A	,, ..	W. J. Watson ..	Laver's Hill
169	,, Jim ..	A	,, ..	D. Scott ..	Maldon
222	,, Lonsdale ..	A	,, ..	J. Neeson ..	Chetwnyd
170	,, Welshman ..	A	,, ..	J. Moschetti ..	Bealiba
471	,, Wonder ..	A	,, ..	G. C. Roughead ..	Ruby
272	Loch Albyn ..	A	Draught ..	M. O'Keefe ..	Pine Lodge R.S.
141	Lord Aldie ..	6	,, ..	S. E. Mackieson ..	Buchan
274	,, Armadale ..	A	,, ..	H. Thomson ..	Newlyn
472	,, Bindi ..	A	,, ..	R. T. Yapp ..	Bindi
339	,, Bingen ..	A	Light ..	E. J. Janetzki ..	Jeparit
340	,, Chancellor ..	A	Draught ..	W. Flack ..	Leonard's Hill
43	,, Dundee ..	A	,, ..	C. Lippiatt ..	Scotsburn
151	,, Dalmuir ..	6	,, ..	E. W. Harders ..	Dimboola
341	,, Everest ..	A	,, ..	G. R. Ladson ..	Mincha West
473	,, Jellicoe ..	6	,, ..	McMahon Bros. ..	Walpeup
126	,, Lynden ..	A	,, ..	Jas. Vickers ..	Colbinabbin W.
302	,, Northcote ..	A	,, ..	Wm. Hicks ..	Miram
412	,, Percival ..	A	,, ..	J. M. Fahey ..	Gnotuk
44	,, Pilatus ..	A	Thoroughbred	D. W. Major ..	Goroke
474	,, Plunton ..	A	Draught ..	M. J. and J. J. Runceman	Mallan, N.S.W.
88	,, Ronald ..	A	,, ..	E. Allan ..	Ondit
90	,, Wallace ..	6	,, ..	Jas. Farrell ..	Briagolong
127	,, Welkin ..	6	Thoroughbred	W. and H. Carmichael	Swan Hill
548	Lorryman ..	A	Draught ..	C. Baldry ..	Cosgrove
417	Lost Time.. ..	A	Thoroughbred	A. Martin ..	Maffra
171	Loudoun Squire ..	6	Light ..	J. Dunlop ..	Birregurra
172	Loueen	6	,, ..	W. G. Anderson ..	Craigieburn
45	Loyalist	A	Draught ..	O. Gray ..	Wedderburn
91	Lucky Jim ..	A	,, ..	W. H. Morris ..	Woolsthorpe
475	Lue Ribbons ..	A	Light ..	L. Williams ..	Ross Creek
68	Lymm Truffle 2nd ..	5	Draught ..	J. Stokes ..	Melbourne
173	Lyndale	A	,, ..	H. Conn ..	Barrakee
275	Magician	A	,, ..	T. Adkins ..	Korumburra
476	Mainstitch ..	A	Thoroughbred	F. C. Mackay ..	Violet Town
359	Major Dale ..	A	Draught ..	J. Forster ..	Boort
277	,, Lawrence ..	A	,, ..	M. Parnell ..	Katamatite
437	,, Ribbonwood ..	5	Light ..	F. W. Grabsch ..	Horsham
549	,, Style ..	A	Draught ..	R. Boldt ..	Silvan
174	,, Thornley ..	6	,, ..	T. Torpey ..	Turriff
223	Malacca	A	Light ..	Beattie Bros. ..	Tungamah
550	Maltdale	6	,, ..	H. Williamson ..	Whorouly
360	Maltese Cross ..	A	,, ..	T. J. Witherow ..	S. Wangaratta
342	Mambrino Wilkes ..	A	,, ..	J. Brown ..	Horsham
128	Maori Chief ..	A	,, ..	John Caldow ..	Winchelsea
391	,, Jack ..	A	Draught ..	A. Potter ..	Naroghid
94	Marcus	A	Light ..	W. E. J. Craig ..	Melbourne
343	Marmaduke ..	A	Pony ..	A. J. Gillies ..	Noorat
418	Masher Boy ..	A	,, ..	T. Mellington, jun.	Rainbow
224	Master Dix ..	A	Thoroughbred	P. T. Larsen ..	Eskdale
477	,, Valve ..	A	Pony ..	A. Lang ..	Castlemaine
111	,, Wattee ..	A	Draught ..	Brock Bros. ..	Moe
93	McGregor's Fancy ..	A	,, ..	R. J. Wilson ..	Krowera
378	Medbourne Prince ..	A	,, ..	F. Shaw ..	St. Arnaud

STALLION REGISTER, 1922-23—*continued.*

Cert No.	Name	Age.	Class.	Owner.	Address.
		Yrs.			
225	Melrose Bounty ..	A	Light ..	Melrose Dairy Coy. Pty. Ltd.	Malvern
478	Menkawrah ..	A	Thoroughbred	J. L. Vallence ..	Cohuna
551	Message	A	Light ..	A. J. Tack ..	Kongwak
479	Merzug	6	,, ..	H. Doherty ..	Hill End
149	Miniature 3rd ..	A	Pony ..	T. Robertson ..	Macarthur
226	Moira Lad ..	A	Draught ..	C. R. Cunnington	Bamawm East
92	Monty	A	Pony ..	W. H. Morris ..	Woolsthorpe
379	Moolap	A	Light ..	T. Mitchell ..	Durham Lead
324	Morocco Lad ..	A	Draught ..	Mrs. E. Parish ..	Horsham
46	Moving Picture ..	A	Thoroughbred	Exors. T. C. Maidment	Moyston
47	,, ,, ..	A	Light ..	W. Fisher ..	Yaapeet
312	Mystery	A	,, ..	C. E. Fewster ..	N. Brighton
503	Napoleon	A	Draught ..	S. J. Lewis ..	Baringhup
480	Never Forget ..	A	Pony ..	F. Ballard ..	Picola
48	Newton Banks ..	A	Draught ..	O. Shaw ..	Wooriwyrite
49	,, Mains ..	A	,, ..	J. A. G. Wilson ..	Kenilworth
175	Newton's Best ..	A	,, ..	C. A. Graham ..	Rupanyup
303	Nimrod	A	Pony ..	G. Small, jun. ..	Birchip
481	Norval Junior ..	A	Light ..	J. English ..	Bulart
344	Oaklands Pride ..	A	Draught ..	C. F. Dolan ..	Ouyen
176	October	A	Light ..	N. F. Johnson ..	Nalinga
482	Onward O ..	A	Draught ..	E. Coward ..	Congupna Rd.
177	Operation	A	Light ..	T. Ley, jun. ..	Tallangatta
552	Orewar	A	,, ..	T. J. Pratt ..	Colac
278	Orion	A	Thoroughbred	W. D. Cross ..	Tangambalanga
483	Patchwork ..	A	Light ..	H. Milte ..	Lascelles
142	Patrician	A	Draught ..	W. Gibbons ..	Galah
361	Patrick's Pride ..	A	,, ..	E. L. Edwards ..	Bacchus Marsh
419	Patriot	A	,, ..	A. G. Mibus ..	Croxton E.
50	Patriotic	A	,, ..	H. L. Ferry ..	Buangor
227	Pearlyn	A	Light ..	F. W. Bowden ..	Won Wron
420	Perfection ..	A	,, ..	E. A. Baker ..	Gilleston
228	Peterhof	A	Thoroughbred	W. T. Rowe ..	Wallinduc
257	Piper	A	Pony ..	Jas. Ford ..	Wickliffe
241	Pleasant Voyage ..	5	Light ..	W. Maloney ..	Mooroopna
152	Politician	A	,, ..	W. J. Wood ..	Moyhu
155	Premier Again ..	5	Draught ..	D. C. Greig ..	Melbourne
582	,, Jack ..	A	,, ..	J. W. Smith ..	Elmore
279	,, Massey ..	A	,, ..	Thos. Haw ..	Mitiamo
229	,, Montgomery of Willowbank	A	,, ..	E. Doherty ..	Congupna
484	,, Thomas ..	A	,, ..	C. A. Lindorff ..	Wood Wood
51	Pride of Clutha ..	A	,, ..	J. H. Cornfoot ..	Glenvale
530	,, Lochiel ..	A	,, ..	J. T. Ovens ..	Cooma
553	,, the South ..	A	,, ..	Mrs. S. E. Kent ..	P.B., Sheep Hills
112	Prince Aldie ..	A	,, ..	Brock Bros. ..	Moe
52	,, Alexander ..	A	,, ..	Trask Bros. ..	Warncoort
485	,, Bally ..	A	Pony ..	H. C. Bird ..	Yarram
95	,, Bells ..	A	Light ..	R. Youren ..	Natte Yallock
421	,, Charming ..	A	,, ..	Williams Bros. ..	Thornton
316	,, Derby ..	5	,, ..	Vines and Hardy	Hawthorn
186	,, Hafrod ..	4	Pony ..	Miss B. B. Reid ..	Bundoora
53	,, Harold ..	A	Light ..	C. E. Darley ..	Hopetoun

STALLION REGISTER, 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
380	Prince Lyall ..	6	Pony ..	G. L. Buchanan ..	Horsham
368	,, Maurice ..	A	Light ..	W. McNaughton	Walpeup
230	,, of Nullan ..	A	Draught ..	R. V. Quick ..	Brim
153	,, Rhymney ..	6	Pony ..	E. Kennedy ..	Bass
129	,, William ..	A	Draught ..	W. R. Berger ..	Devenish
422	Quatta's Belmont ..	6	,, ..	M. Lindsay ..	Baranduda
445	Radium	6	Light ..	Manifold and Co.	Camperdown
96	Reality Rex ..	A	Pony ..	John Archibald ..	Sale
118	Red King	A	Light ..	W. Holland, sen.	Benambra
447	Referee	A	Draught ..	P. Lock ..	Warrnambool
97	Relight	A	Light ..	D. Cameron ..	Newham
345	R. H. Y. Harold ..	6	Pony ..	V. Ladlow ..	Dooen North
231	Ribbon Bells ..	A	Light ..	Beattie Bros. ..	Tungamah
381	Rimfire	A	Pony ..	Lucas Bros. ..	Carlisle River
178	Robin Hood III. ..	A	,, ..	Noyes and Griffiths	Drouin
292	Rocket	A	,, ..	A. W. Thomson ..	Hamilton
212	Roseberry ..	6	Light ..	E. McKoy ..	Wodonga
570	Royal Albert ..	A	Draught ..	R. J. Evans ..	Bushfield
250	,, Belmont ..	A	,, ..	Goss Bros. ..	Donnybrook
98	,, Ben ..	A	,, ..	J. M. Hamilton ..	Inverleigh
54	,, Blend ..	A	,, ..	T. Long ..	Nhill
6	,, Chief ..	3	,, ..	W. G. Burns ..	Goroke
280	,, Churchill ..	A	,, ..	A. Kennedy ..	Tatura
554	,, Crown ..	A	,, ..	J. A. Goodwin ..	Wunghnu
346	,, Dandy ..	A	Pony ..	D. Fletcher ..	Gannawarra
145	,, Duke ..	6	Draught ..	Exors. C. W. Dennert	Hamilton
555	,, Escort ..	A	,, ..	Hooper Bros. ..	Devenish
330	,, Fashion ..	A	,, ..	Ed. Cuthbert ..	Camperdown
55	,, Garvin ..	A	,, ..	G. F. Brown ..	Winchelsea
362	,, Hero ..	A	,, ..	G. Giddings ..	Sea Lake
423	,, Mac ..	6	Light ..	Charity Bros. ..	Serpentine
138	,, Malt ..	5	Thoroughbred	R. H. Ward ..	Sandringham
354	,, Mint ..	A	Light ..	L. A. Harper ..	Rutherglen
130	,, Prince ..	A	Draught ..	C. E. Umbers ..	Sea Lake
305	,, Robin ..	A	,, ..	J. Boyle ..	Boort
121	,, Robin ..	A	,, ..	A. Pyers ..	Charlton
201	,, Saxon ..	A	,, ..	C. E. Barrie ..	Melton
398	,, Scott ..	A	,, ..	D. Golding ..	Cocamba
424	,, Shepherd ..	A	,, ..	Jas. McBean ..	Miga Lake
425	,, Standard ..	A	,, ..	K. Cameron ..	Warracknabeal
525	,, Treasure ..	A	,, ..	W. H. Thompson	Yalca
179	,, Willie ..	A	,, ..	K. Cameron ..	Warracknabeal
99	Safe Voyage ..	6	Light ..	V. Meyers ..	Lockwood
56	Sahara	6	Pony ..	E. A. Mahar ..	Kerang
426	Santrel	A	Light ..	R. W. Storey ..	Murchison E.
131	Saturn	A	Pony ..	A. J. Plum ..	Docker's Plain
190	Scotch Thistle ..	4	Draught ..	J. R. Stokes ..	Melbourne
37	Scotland's Peer ..	A	,, ..	D. Gardner ..	Milawa
451	Scottish Lad ..	A	,, ..	D. L. Bodey ..	Jung
306	Sea King	A	,, ..	A. McCready ..	Colac
583	Seldom	A	Light ..	R. N. Keating ..	Antwerp
281	Selkirk	A	Draught ..	T. T. Mulder ..	Murroon
245	Senator	6	,, ..	J. R. Stokes ..	Abbotsford
556	Shandon Bells ..	A	Light ..	A. Missen ..	Truganina
240	,, ,, ..	A	,, ..	T. Long ..	Nhill
325	Shepherd Plaid ..	A	Draught ..	Mrs. E. Parish ..	Horsham

STALLION REGISTER, 1922–23—*continued.*

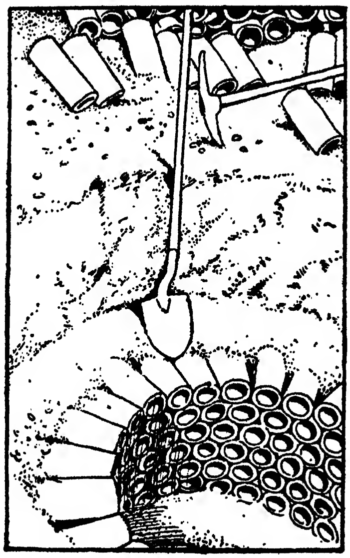
Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
57	Shepherd Boy ..	6	Draught ..	I. Kelly ..	Korong Vale
557	Shilinga	6	Light ..	D. McLennan ..	Derrinallum
558	Silver Bells ..	A	,, ..	T. Coonerty ..	Yarragon
137	,, King ..	6	,, ..	E. D. Scown ..	Terang
58	Silverlight.. ..	A	Pony ..	R. J. Jarvis ..	Cudgewa
119	Silverton	A	,, ..	J. Rogers ..	Allansford
59	Sir Clyde	6	Draught ..	S. J. Taylor ..	Lake Boga
10	,, Fabric	5	,, ..	Allitt Bros. ..	Diapur
486	,, Goulding ..	A	Pony ..	S. T. Rash ..	Ballarat
559	,, Hector.. ..	A	Draught ..	F. Wallbridge ..	Somerton
347	,, Onward ..	A	,, ..	W. Guymer ..	Katamatite
427	,, Regulus ..	A	,, ..	J. B. Howe ..	Bridgewater
560	,, Roderick ..	A	,, ..	W. Burn ..	Trentham
191	,, Rupert ..	3	,, ..	J. J. Power ..	Rochester
428	,, Wilfred ..	A	,, ..	A. J. Mackay ..	Coonooer Bridge
590	,, William Wallace	A	,, ..	O. W. Fisher ..	Morgan's Bridge
382	Skobeloff	A	Thoroughbred	A. Thomson ..	Lismore
143	Snapshot	6	Light ..	H. Crawford ..	Dunkeld
383	Solomon IV. ..	A	Draught ..	C. H. Perkins ..	Rainbow
187	Some Sensation ..	3	Pony ..	Miss B. B. Reid..	Bundoora
307	,, Style ..	6	Light ..	T. F. Armstrong	Campbell's Creek
132	Southern Star ..	A	Draught ..	L. Curran ..	Cannie
384	Springwood ..	A	Light ..	G. J. Vagg ..	Cobden
100	Squib	A	Pony ..	A. Robertson ..	Koria
133	Stanley May ..	6	Draught ..	G. R. Ladson ..	Mincha West
232	Starlight	A	,, ..	J. Fuller ..	Mitre
561	Starlight	A	Pony ..	J. Giles ..	Bairnsdale
60	Stern Anchor ..	A	Thoroughbred	A. Noble ..	Birregurra
282	Stirling Castle ..	A	Draught ..	V. McHenry ..	Cowes, Ph. Isd.
309	,, Prince ..	A	,, ..	R. A. Cumming ..	Bael Bael
61	St. Mark	A	,, ..	F. Marshman ..	Brim
120	Stockman's Lad ..	A	,, ..	D. C. Gilsenan ..	Bung Bong
310	Straightaway ..	A	Light ..	T. Allen ..	Narrewillock
385	St. Simon	A	Draught ..	G. J. Butler ..	Carisbrook
311	St. Swivan ..	A	Thoroughbred	S. Raine ..	Bendigo
365	Style O	A	Light ..	W. Barry ..	Heathcote
209	Sudbourn's Victory..	6	Draught ..	A. C. Head ..	Mansfield
233	Sunbury	A	Light ..	T. C. Nolan ..	Tarrawingee
134	Sweet Abbey ..	A	,, ..	N. Chamberlain ..	Morwell
562	Taffy	A	Pony ..	H. Jarvis ..	Omeo
101	,, ...	A	,, ..	J. Sargent ..	Yanac
304	Tatahu	6	Light ..	M. Stephenson ..	Fitzroy
234	Tax Payer ..	A	Pony ..	R. Jamieson ..	Darlington
600	The Abbot ..	A	Light ..	A. B. Hamilton ..	Fish Creek
62	,, Factor ..	A	Draught ..	C. Bates ..	Dobie
563	,, General ..	A	,, ..	W. Lincoln ..	Portarlington
63	,, Hague ..	A	Thoroughbred	S. Winter Cooke	Hamilton
244	,, Joker ..	A	Pony ..	A. E. Ellery ..	Redesdale
492	,, Premier ..	A	Draught ..	G. Taylor ..	Leichardt
487	,, Standard ..	A	,, ..	J. Forsyth ..	Murrayville
154	,, Starling ..	A	Light ..	S. Farrell ..	Stratford
283	,, Warrior ..	A	Pony ..	H. Wilson ..	Wodonga
488	Thoughtful ..	A	,, ..	P. McIntosh ..	Ondit
429	Tim Brigham ..	A	,, ..	J. C. Nicoll ..	Euroa
564	Titanic	A	,, ..	J. E. Mark ..	Echuca
293	Toby	A	,, ..	A. W. Thomson..	Hamilton

STALLION REGISTER, 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
565	Togo	A	Draught ..	H. Currie ..	Waterloo
284	Tom Tit	A	Pony ..	R. W. Jukes ..	Maryborough
64	Tony Bells ..	A	Light ..	R. Hannah ..	Lilydale
430	Torfrid	A	Thoroughbred	D. Rogers ..	Boolarra
243	Toy Bells	A	Light ..	W. H. Horn ..	Ararat
489	Trafalgar	A	Thoroughbred	Exors. W. E. Mitchell	Corryong
313	True Steel	A	Pony ..	Letcher Bros. ..	Avon Plains
294	Trump	A	,, ..	A. W. Thomson ..	Hamilton
314	Udale	A	Draught ..	J. Holdsworth ..	Jung Jung
490	Vanquisher ..	A	,, ..	J. Meagher ..	Murrayville
491	Varco	A	Thoroughbred	W. McMeeken ..	Kerang
117	Viking of Methven ..	A	Pony ..	Mrs. Maclellan ..	Windsor
235	Waironga Prince ..	A	Draught ..	G. W. Fielding ..	Watchem
180	Wally	A	,, ..	N. C. Keating ..	Speed
566	Wee Jim	A	Pony ..	J. R. Kettyle ..	Castlemaine
65	Welsh Flyer ..	A	,, ..	F. Irving ..	Tyrell Downs
431	,, ,, ..	A	Light ..	P. J. Reid ..	Milawa
236	,, ,, IV. ..	A	Pony ..	J. Williams ..	Nalinga
432	Westmont	A	Light ..	Wm. Hay ..	Bullock Swamp
181	What Oh	A	Pony ..	R. J. Hill ..	Dandenong
567	What's Wanted ..	A	,, ..	G. T. Brown ..	Officer
285	White Stockings ..	A	Light ..	Munro Bros. ..	Walpeup
433	Wigtonshire ..	A	Draught ..	Burton Bros. ..	Dennison
1	Wigton's Pride ..	3	,, ..	L. J. King ..	Quambatook
286	William of Orange ..	A	Thoroughbred	A. J. Gray ..	Essendon
287	Wiltshire	A	Light ..	C. Wood ..	Minyip
568	Windlesham ..	A	Thoroughbred	W. T. Hillman ..	Bendigo
348	Winsome Chief ..	6	Draught ..	Peterson and Bourchier	Kellalac
289	Winteriga ..	A	Thoroughbred	W. Coe ..	Coleraine
326	Wonga	A	Light ..	Mrs. E. Parish ..	Horsham
144	Woodlands Dandy ..	A	Pony ..	J. H. Kittyea ..	Jung
386	Yarrawaak ..	A	Light ..	F. D. Macdonald	Terang
363	Yeneda	A	Thoroughbred	D. A. Hutchison	Yan Yean
315	Young Badaween ..	A	Pony ..	W. Shaw ..	Wycheproof
493	,, Brigham ..	A	,, ..	J. A. Darlington	Paradise
237	,, ,, ..	A	,, ..	W. J. Craig ..	Cobden
434	,, Clarionet ..	A	Light ..	John Mitchell ..	Piavella
494	,, Clyde ..	A	Draught ..	J. Ludeman ..	Nirranda
276	,, Comet ..	A	Pony ..	T. Adkin ..	Korumburra
495	,, Coronation ..	A	Draught ..	G. Pitt ..	Jeparit
102	,, Cymra Bach	A	Pony ..	S. J. Douglas ..	Stuart Mill
435	,, Dundonald ..	A	Draught ..	R. Coleman ..	Milawa
182	,, General ..	A	Pony ..	W. Maddill ..	Tongala
448	,, Ginger ..	A	,, ..	Manifold and Co.	Camperdown
183	,, Hamilton ..	A	Draught ..	Arnold Bros. ..	Rupanyup N.
150	,, Ki Ki ..	A	Pony ..	T. Robertson ..	Macarthur
387	,, Lyon ..	A	Draught ..	A. W. Brown ..	Speed
497	,, Nailstone ..	A	,, ..	J. J. Nulty ..	Walpeup
66	,, Patrician ..	A	,, ..	F. E. Southwell ..	Linga
569	,, Prince Royal	A	,, ..	W. D. Gibb ..	Moyhu
184	,, Royal Oak ..	A	,, ..	H. Walker ..	Merbein
364	,, Shifter ..	A	Light ..	A. Linke ..	Jeparit
67	,, Timekeeper	A	Draught ..	Stokes and Caffrey	Melbourne
135	,, Yelretso ..	A	Light ..	M. Ford ..	Maryborough

THE DRY WELL FOR DRAINAGE.

When there is a gravel subsoil the dry well has proved a cheap and very efficient means of drainage for the surface water. It is especially appropriate for draining low, wet places in the barn-yard, the pig-yard, and around the watering-trough and farm buildings. The construction is very simple. One digs a hole 4 or 5 feet in diameter down to a few feet into the gravel. The size of the hole should depend largely on the amount of surface water to be removed at any one time. In most cases this hole is filled with large stones or other



coarse material, which allows the water to escape into the gravel, where it is carried away very rapidly. The accompanying illustration shows one of these dry wells walled up with tile. This leaves a much greater gravel surface, and thus enables the water to get away more quickly than where the well is filled up with rocks or other coarse material. When tiles are used, the centre of the well is not filled at all, but the tiles are simply used as a well to keep the gravel from caving in, and to allow the water to escape. The well is covered with 2 x 6 boards, with small cracks left between them so that the water may enter the well. These boards may be sunk into the ground about 6 inches, and covered over with small stones, giving it a much neater appearance, and removing all possibility of stock slipping on the boards.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose, friable, and well opened. The consolidation of the surfaces must be avoided, as a hard, compact surface means the loss of much soil moisture, by capillary attraction. So that after rains, heavy dews, the spray pump and other traffic, it will be as well to run the harrows over the surface of the soil, so as to keep the surface well broken and to maintain a good earth mulch. If the harrows are not sufficient to break the clods, a spiked or heavy roller should be drawn over it, and then harrowed. If the weather is at all dry it is advisable to plough only as much as may be harrowed in the same day. By immediately following up the ploughing with harrowing a minimum amount of moisture is lost by capillarity.

Green manure crops should now be ploughed under, and should they be very abundant in growth, a roller should be run over them and ploughed with a coulter attached. Any of these means will serve to get the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress the weeds which rob the trees of food and moisture. The suppression of weeds is an important work in the spring and summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time of the year, an important work in the orchard. Bordeaux or lime sulphur spraying for the black spot of apples and pears, for scab and shothole in peaches and apricots, for the leaf curl of the peach and rust of the plums and peaches, should now be completed.

Where there are indications that previous sprayings have not been thoroughly successful, a weak lime sulphur spray should be given.

Wherever they are present, nicotine sprays should be given to combat the peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the Codlin Moth spraying, it is quite of the opposite value when used for the pear and cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead. Even a dry dusting with lime or with ordinary soil will keep the slugs in check.

Codling moth spraying, too, will be in evidence this month. It is generally assumed that the appearance of the moth is coincident with

the bursting of the flowers. This is not always so—the moths frequently come slightly later than the blooming period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for the Codlin moth, nothing having been found to supersede it.

Arsenate of lead may be mixed with nicotine sprays, or with Bordeaux mixture, without any detriment to either spray, if necessary.

The Vegetable Garden.

A good tilth, and a well-pulverized soil, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones: thus a good water supply will need to be maintained. Weeds are great moisture-robbers, and they should be kept out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bone-dust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in limited quantities, 6 or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ozs. per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that 3 ozs. scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths that are not gathered for eating should be cut out of the beds.

The Flower Garden.

Flower gardens are troubled with many pests at this time of the year. Rose aphis is one of the most prevalent; frequent applications of tobacco water will keep this pest in check. The hot winds should not be waited for so as to rid the garden of the pests, because a great deal of damage is done before the hot winds come. They should be sprayed in any case.

Rose mildew will also need combating. This may be done by dusting the bushes with sulphur while they are wet with the morning dew. The ground may also be sprinkled, as the fumes check the fungus.

The latest American remedy is to dust the bushes with one part of dry arsenate of lead to nine parts of sulphur. This is also a remedy for black spot of roses.

Leaf-rolling or leaf-eating insects will need to be sprayed with arsenate of lead or Paris green.

The surface should be kept well hoed so as to conserve the moisture, especially after the frequent waterings that should be given.

Chrysanthemums may be planted in soil that has been dug over two or three times, and each time digging in manure. The soil must not be too rich, but must be well drained.

Bulbs that have lost their foliage may be lifted, but do not cut the foliage, as this means loss of sap and energy.

Asters, zinnias, salvias, balsams, amaranthus, celosias, &c., lobelia, bedding begonia, iresines, alternantheras, &c., may now be planted out for summer and autumn flowers.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

Horses.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares due to foal should be put on poorer pasture. Turn out workers due for a spell at grass. In view of sand trouble this year horses which have been paddocked all the winter should not be put to work until properly conditioned and any sand accumulation got rid of. A course of three or four bran mashes, after a twelve hours' fast, followed by 1 to 1½ pints of linseed oil, is helpful. Repeat in two or three days, if necessary. Colts to be gelded should be operated on before hot weather sets in.

Cattle.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Year-Book of Agriculture*, 1905, page 314. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will.

Pigs.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal, or half that amount of mineral phosphate per 100 lbs. live weight in food daily. If pigs are lousy dress them with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Sheep.—Prepare for dipping. Ascertain exact contents of bath before mixing. Powder or paste dips have the most lasting effect, particularly where lice have been bad. Hold sheep in the bath not less than half a minute; if badly infested, longer. Submerge heads twice, but allow them to rise quickly—most deaths after dipping are due to gross carelessness in holding sheep under too long, the dip wash being taken in on to the lungs. Dip rams and full grown sheep first, while bath is full, lambs last. Yard sheep over night. Dip while empty, and avoid fouling the drainer. Commence early in the day, and allow sheep to dry before nightfall. Avoid travelling long distances to and from baths, and

dipping sheep while overheated. Do not roughly throw sheep in. Avoid filthy baths; this increases a dead tip in hot areas, and as a rule are over strength.

It is unsafe, and against instructions, to use powder dips in increased strength. Sheep badly lice-infested should be dipped directly off shears, and again in six weeks' time. Sheep with over a reasonable amount of wool on should be dipped at less strength than given on instructions. Close, fine-wooled sheep particularly so.

When constructing new dips, remember moderate-sized ones are most economical, just as efficient, and can be more easily emptied as they become fouled, and if they are near water can be quickly filled.

BEE-KEEPING.

In most districts, October is the principal swarming month; in late localities, particularly at the higher elevations, most of the swarming takes place in November. Where a honey flow is expected from Redgum during December and January, it is not wise to make a further increase in the number of colonies by allowing after-swarms to come off and hiving separately, as the parent stock would be too much depleted of bees, and there would not be sufficient time for it to recover, or for the swarms to build up, before the honey flow is on, and much of it would therefore be lost.

After-swarms can best be prevented by hiving the first or prime swarm on the old stand and moving the colony from which it came to a new stand, at the same time destroying all the queen cells in it except one—the most perfect and forward one.

If no increase at all is desired, the parent colony may be left alongside the old stand on which the swarm was hived, but with the entrance facing in a different direction. When the young queen in the swarmed stock is laying, which will be in about three weeks, the hive may be gradually turned round till it faces the same way as the swarm, and, after removing the old queen from the swarm, the two stocks may be re-united, thus making a very strong colony with a young laying queen, in the best condition for storing honey and very unlikely to swarm again the same season.

As in most localities the colonies have come through the Winter very strong, there is likely to be much swarming wherever Cape Weed or some other pollen-yielding plant is plentiful, the duration of blooming depending, of course, upon the weather.

When several days of bad weather follow the hiving of swarms, it may be advisable to feed sugar syrup (one part sugar to one part water) to keep up comb-building and brood-rearing, so as to have the greatest number possible of field bees in the hive during the honey flow later on. Honey should never be used for feeding bees, unless it comes from an apiary which has been absolutely free from disease for at least two years.

CULTIVATION.

FARM.—Plant main crop of potatoes. Cut hay and silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

VINEYARD.—Field grafts require careful attention in the way of removal of suckers and scion roots. (See Bulletin on "Spring Grafting," No. 38, page 29.) Keep a sharp look out for Downy Mildew; whether the disease is seen or not, finish spraying by 20th October. A preliminary spray when the bunches are most visible is strongly recommended. In irrigated vineyards make it a rule to *spray immediately before watering*. Information on "Mildew and its Treatment," will be posted on application. Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible during summer. Proceed with tying up, stopping and topping. Avoid excessive topping, summer pruning being usually more injurious than useful in warm, dry climates. Cincture Zante currant vines after flower caps have fallen. Apply second sulphuring just before blossoming, wherever Oidium was prevalent last year.

Cellar.—Taste all young wines; beware of dangerous symptoms in unfortified fruity wines, which may need treatment. Fill up regularly all unfortified wines.

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DAIRY FARMING.

By R. T. Archer, Senior Dairy Inspector.

A dairy farmer should always, as far as possible, breed and rear his own calves, paying the greatest attention to the selection of calves from the best butter-producing cows as ascertained by the scales and Babcock test. Just as great care should be given to selecting a bull calf as in the choice of heifers. It is no use rearing bulls from cows that are not good producers.

By rearing one's own stock the improvement of the herd will be surer and more rapid than would otherwise be the case. There is also less liability of introducing such diseases as contagious abortion, tuberculosis, pleura-pneumonia, contagious mammitis, &c., which are the cause of so much loss whenever they develop.

A certain percentage must be culled from a herd every year owing to accident, disease, age; or because their small returns make them unprofitable to keep. The number of rejects in any year will probably amount to one-third or one-fourth of the total number of the herd.

Care of Cow during Pregnancy.

The dam should be properly nourished during the period of pregnancy, whether she is in milk or dry, so that her calf will be well developed when born. A careful record should be kept of the date of service, so that it will be known when the cow is due to calve, and that she may be kept under observation. As the time approaches the udder will develop and milk will be formed. The vulva will become enlarged, soft, and to some extent inflamed, and the muscles and cartilage on each side of the tail become very much relaxed.

Difficulty in Calving.

When the cow is about to calve she should not be interfered with too soon, but nature should be allowed to take its course, and in nine

out of ten cases there will be no need for interference. The tenth case, however, may be a very valuable cow, and if it is seen that she cannot calve without assistance this should be given.

If the calf is coming normally it will be with the two front feet first, and the head resting between them straight and with the nose following the fore feet. Occasionally, especially in a heifer giving birth to her first calf, the passage will be so small that assistance will be necessary. In this case take hold of the fore-legs and pull gently when the animal labours. In case of the hind legs coming first, if the legs are pointing towards the udder, the calf may be taken away as in a normal presentation, without any ill-effects.

If the calf be twisted, *i.e.*, head turned back, or else a breach presentation with legs under the body, &c., it must be pushed back and turned. Sometimes this is a matter of some difficulty, and it may be necessary to get a pulley block, and with a rope attached to the cow's hind legs, hoist her up until the weight of the calf is thrown forward. This will make it easy to get the hand in and turn it. In such a case it is advisable to obtain the services of a veterinary officer.

Before inserting the hand it should be smeared with carbolic oil (1 to 20), in which a little laudanum is mixed. The cow should be raised immediately after calving to prevent straining.

Calf Rearing.

Care of the Young Calf.

As soon as the calf is born, care must be taken to remove any membrane from the head to allow it to breathe. If the cow is allowed, she will lick the calf dry, but if it be taken away immediately, it should be rubbed dry with clean straw and kept warm.

A wise precaution against contagious diarrhœa is to tie the navel and dress it with iodine immediately the calf is dropped. Although this disease is not common in Victoria, in a few places it has been the cause of very heavy loss, and in the older countries it is a disease widely spread.

The calf should have its mother's biestings or colostrum for the first five days. About a pint and a half should be fed to it three times a day. The biestings act medicinally and clean out the bowels. Should it happen that the cow's biestings are not available, the calf should be given from one to two ounces (according to size) of castor oil in a little milk—to be repeated, if found necessary.

The Growing Calf.

After the fifth day new milk may be substituted for biestings. When calves are a week or ten days old, it is a good plan to put a little dry meal into their mouths immediately after feeding. This will divert them from sucking the ears of their mates. After a little while they will learn to take the meal out of a trough.

When calves are a fortnight old half-a-pint of skim milk may be added to each feed, and instead of three times they may be fed only twice per day. At a month old they may be fed entirely on skim milk, and, if possible, some lucerne or clover. If lucerne or clover is not available

then give some fine hay, or bran and good sweet chaff, or crushed oats. If they can be given some good grass, so much the better.

A good grain mixture is: Maize meal, 3 parts; ground oats, 3 parts; wheat bran, 1 lb.; linseed oil meal, 1 lb.

The following mixture is used almost throughout Ireland, and is recommended by the Department of Agriculture there:—

Two parts, by weight, maize meal.
Two parts, by weight, oat meal.
One part, by weight, linseed meal.

All finely ground.

Mix with sufficient boiling water to make a thick gruel, bring to the boil, and allow to stand for twelve hours before being fed with skim milk. Feed ¼ lb. per head daily, increasing to ½ lb. or more as found necessary.

Ground millet has been found quite suitable for feeding young calves, and may be fed 1 lb. per head for the whole rearing period of seventeen weeks. At the Woburn Experiment Farm in England separated milk is fed to calves and crushed oats are given dry.

Cod liver oil (5s. 6d. per gallon) has been found an excellent substitute for butter fat in feeding skim milk to calves. It is known that it contains vitamines which are essential for the growth of young animals and not contained in vegetable oils. The following will be found a good guide for the use of cod liver oil:—

—	Whole Milk.	Separated Milk.	Cod Liver Oil.	Meal.
First 2 weeks	6 to 8 pints			
3rd week	6 pints ..	3 pints ..	..	2 oz. daily
4th week	3 pints ..	6 pints ..	..	4 oz. daily
5th week	..	8 pints ..	1 fluid oz.	4 oz. daily
6th week	..	8 pints ..	2 fluid oz.	6 oz. daily
7th week	..	8 pints ..	2½ fluid oz.	6 oz. daily
8th week	..	8 pints ..	3 fluid oz.	6 oz. daily
9th week	..	8 pints ..	3 fluid oz.	4 oz. daily

The oil should be measured in fluid ounces (an ounce is two tablespoonfuls) into the bucket, the milk poured on to it and well stirred. In this way it mixes well with the milk. The meal may be measured out in the same way.

Meal fed dry gives just as good results as if made into gruel.

The following is a good guide to feeding the young calf:—

At 8 weeks old, 10 lbs. skim milk daily.
At 9 weeks old, 12 lbs. skim milk daily.
At 10 weeks old, 14 lbs. skim milk daily.
At 12 weeks old, 16 lbs. skim milk daily.
At 14 weeks old, 16 lbs. skim milk daily.
At 16 to 24 weeks old, 18 lbs. skim milk daily.

In addition, they should be given as much grain or hay as they will clean up.

Sunlight, fresh air, and exercise are essential to the healthy growth of young calves. Valuable stud animals should, when practicable, be groomed.

Three Essential Rules.

Three rules which must be observed in rearing calves are:—

1. *Do not overfeed.* Better give too little than too much. If the stomach is overloaded with milk the milk will coagulate and hard lumps of curd, which cannot be digested, will be formed. This sets up an irritation which cause white scour (quite distinct from the contagious form), and if not checked develops into dysentery, from which the calf dies.

2. *Observe cleanliness.* This is particularly necessary in the case of feeding utensils. There are more calves killed in this country through being fed with dirty milk in dirty utensils than from any other cause. The best way to manage the feeding of calves is to provide small bails with a separate bucket for each. Half kerosene tins will do, but 2-gallon buckets will be more convenient, as they will slip into one another, and so be convenient for handling and cleaning. These tins should be washed every day. If troughs are used, they should be of metal, so that they can be properly cleaned, and the calves must be closely watched to prevent over-feeding. The bail system may appear extravagant and laborious, but it has been adopted successfully by many large dairy farmers.

The temperature of the feed should be as near that of the body as possible, *i.e.*, 101 deg. Fahr. If too cold the system gets a chill, and the digestive organs become deranged.

Whey for Calves.

Owing to its watery appearance, many farmers conclude that whey is of very little value as a food for calves. However, it is worth just half as much per gallon as separator milk. It contains about 5 per cent. sugar, ¾ of 1 per cent. albumen, and ¾ of 1 per cent. ash, chiefly phosphate of lime. The casein and fat have been converted into cheese, therefore, the casein, which is the flesh-forming constituent, must be replaced by something else. Linseed cake meal is one of the most satisfactory foods for this purpose, being rich in protein and containing also a good percentage of fat. There is no doubt cod liver oil may be added with good effect, as it contains a vitamine which will be a good substitute for that removed in the butter fat.

The reason many do not have satisfactory results when feeding whey is due to the want of sufficient care. If possible, it should be fed quite fresh from the curd, but when it is necessary to keep it for some time, as in the case of a cheese factory, when the whey is a day old, it must be scalded as soon as it is run off the curd. This insures its being delivered in a wholesome condition. The scalding may be done by running all the whey into a vat or tank and turning steam direct into it and heating it up to over 150 deg. Fahr. When feeding whey to calves mix linseed meal with it and feed at body temperature. As in the case when skim milk is fed to calves, other foods, such as hay, meal, grass, &c., should also be given.

It may be mentioned that some of the best cattle in the State are reared on whey.

Mixtures, etc., for Growing Stock.

Linseed cake meal is found to give excellent results whether fed with milk, whey, or alone. The linseed should be boiled or scalded to destroy the ensymes natural to it, otherwise it may set up chemical action detrimental to the calf. If fed dry this is not necessary.

With pure linseed (either whole or ground) 1 lb. may be used to 1 gallon of water. Stir until all froth disappears and the mixture is perfectly smooth, no lumps remaining.

A little wheat flour counteracts laxative effect of linseed; maize meal or oatmeal will encourage it.

Half a pint of lime water daily per calf in the food is a valuable addition.

Hay Tea.

This is made by steeping hay in a copper of water and then boiling for one to two hours until 12 lbs. of hay produces 100 lbs. of tea. The tea is then fed in quantities similar to separated milk; $\frac{3}{4}$ lb. of linseed meal may be made into a jelly and fed along with the hay tea. Dry hay, meal, grain, &c., should be given as usual.

Linseed Jelly.

To prepare linseed jelly, add 1 pint of seed to 1 gallon of boiling water and keep simmering from three or four hours.

Lime Water.

Lime water is made by putting some quick-lime into a tub and filling it with water. After settling, the clear water will contain lime in solution. As it is used up fill the tub again, and repeat this as any lime remains soluble. To test this, breathe into a glass of the liquid through a straw or tube, and if the water becomes milky there is still soluble lime. If it remains clear, empty out the residue and put in fresh lime. A tinned vessel should not be used for lime.

At Six Months Old.

At six months old milk may be stopped (although, of course, it is always a good food), and the calves turned out to pasture, the heifers being kept apart from the bulls.

Always treat calves so that they will be kept growing all the time, although they do not require to be fat, except the beef breeds, such as the Shorthorn, Hereford, and Polled Angus. The dairy cow must have plenty of depth of body to be able to give satisfactory returns, plenty of constitution, and capacity for converting a large amount of fodder into milk of good quality. To this end the calf must be kept growing.

All changes in feeding should be made gradually. Sudden changes in feed, &c., are likely to be harmful.

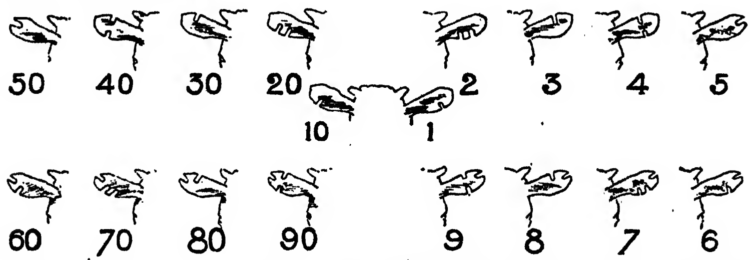
When calves are six months' old they may be given up to 3 lbs. each daily of mixed calf feed; also lucerne, clover, or meadow hay. The leaves of lucerne is especially good for calves.

Cost of Rearing Calves.

	£	s.	d.
Six months' skim milk, 1 gallon per day, at 2d. per gallon	1	10	0
Grass, twelve months, at 9d. per week	1	19	0
Grass, nine months, at 1s. 3d. per week	2	8	9
Labour	0	10	0
Hay, chaff, grain, &c.	0	10	0
	6	17	9

Ear-Marking.

The following will be found a very useful and convenient system of marking calves for future recognition. If marked as soon as dropped, and a record made in the stock-book, there will be no difficulty in tracing the calf afterwards:—



In the illustration the notches appear somewhat large, but a quarter-inch punch will not disfigure the ear.

For marking stud or show animals, tatooing a number on the inside of the ear is the best.

Dehorning, etc.

Calves should be dehorned, except those required for show or stud purposes. The best time to dehorn is before the calf is five days' old. Clip the hair from about the base of the horns, slightly moisten the end of a stick of caustic potash, and rub the tip of each horn for about a quarter of a minute. This should be done from two to four times, at intervals of five minutes. If a little blood shows at the centre of the horn, very slight further rubbing will be necessary. Care should also be taken to rub the centre of the horn, and not the sides, and not to have the stick of caustic potash too moist, for if it runs on to the skin a troublesome sore will result. A piece of brown paper should be wrapped round the caustic to protect the fingers.

Bull calves should be castrated when about one month old. If much older, the animal receives more of a check by the operation.

Calf Ailments.

Scours, or Diarrhœa.

These are due to indigestion. On the first appearance of scours stop the feed and give a dose of castor oil (1 to 2 ounces) in a little milk (half pint or so). Then gradually get the animal on to its feed again.

Hoose, or Lung Worm.

If calves have to run on damp ground, they should be provided with a warm, dry shed, and the ground should, as soon as circumstances permit, be thoroughly drained, otherwise they may be affected with hoose, or worm in the throat. If attacked by this complaint, they appear to be in bad health, exhibit a dirty, staring, hard, dry appearance of the coat, and they have a cough, with discharge of mucus. When the mucus is examined under a microscope, embryo worms may be found in it. If a calf which has died from this complaint is opened, a ball of fine worms will often be found in the bottom of the wind-pipe.

Affected calves must be kept dry, warm, and well fed, and given from half an ounce to one ounce of turpentine soaked into dry meal and then mixed with cold gruel. When given in this way the risk of choking from turpentine is reduced to a minimum. The dose may be repeated once or twice after an interval of a few days.

Ringworm.

Young cattle, if in poor condition, are often troubled with ringworm. White scaly patches, without hair (most abundant about the head and neck), caused by a vegetable parasite, appear. These may be destroyed by applying red mercurial blistering ointment, made by mixing one part of biniodide of mercury with sixteen parts of lard, this being half the strength of the blister; if more convenient, carbolic acid may be used instead. The parts should be prepared by scraping off the scales or washing them with kerosene a few days previous to applying the dressing.

Lice.

If cattle, young or old, are allowed to become too poor, or fed for a time on insufficient nutritious food, as barley straw, they are liable to become infested with lice, mostly about the head, neck, and withers, These may be best destroyed by dressing with phenyle or other carbolic preparation. Care should be exercised when applying any wash of a poisonous nature, as serious loss sometimes results through the animal licking its skin.

Blackleg.

The greatest scourge of young cattle is "blackleg," or, as it is sometimes called, "symptomatic anthrax." This complaint most frequently attacks cattle of from about three months to two years old, generally the finest and best conditioned calves about the time of weaning. The symptoms are harsh, dry appearance of the coat, loss of appetite, sometimes stiffness in one leg, accompanied by swelling. The animal invariably dies in 24 or 48 hours. Generally there is a frothy mucous discharge from the nose, tinged with blood. If the fingers are rubbed over the skin a crepitation is apparent like the crinkling of paper, due to the formation of gas beneath the skin. If the swollen part be opened it will generally be found to consist of a yellowish, jellylike, watery tumour. Where mortality occurs from this complaint the whole of the carcasses should be completely destroyed by fire. There is no cure, and the only course open is prevention by inoculation by "blacklegine," which can be obtained from the veterinary surgeon, with instructions how to apply it. If the complaint makes its appearance, all the young cattle should be inoculated.

Gestation Calender (*Woll*).

Average Gestation Period.

Mares .. 48½ weeks (340 days, extremes 307 and 412 days).
Cows .. 40½ weeks (283 days, extremes 240 and 311 days).
Ewes .. 22 weeks (150 days, extremes 146 and 157 days).
Sows .. 16 weeks (112 days, extremes 109 and 143 days).

Time of Service.	Mares, 340 days.	Cows, 283 days.	Ewes, 150 days.	Sows, 112 days.
Jan. 1	Dec. 6	Oct. 10	May 30	April 22
6	11	15	June 4	27
11	16	20	9	May 2
16	21	25	14	7
21	26	30	19	12
26	31	Nov. 4	24	17
31	Jan. 5	9	29	22
Feb. 5	10	14	July 4	27
10	15	19	9	June 1
15	20	24	14	6
20	25	29	19	11
25	30	Dec. 4	24	16
Mar. 2	Feb. 4	9	29	21
7	9	14	Aug. 3	26
12	14	19	8	July 1
17	19	24	13	6
22	24	29	18	11
27	Mar. 1	Jan. 3	23	16
April 1	6	8	28	21
6	11	13	Sep. 2	26
11	16	18	7	31
16	21	23	12	Aug. 5
21	26	28	17	10
26	31	Feb. 2	22	15
May 1	April 5	7	27	20
6	10	12	Oct. 2	25
11	15	17	7	30
16	20	22	12	Sep. 4
21	25	27	17	9
26	30	Mar. 4	22	14
31	May 5	9	27	19
June 5	10	14	Nov. 1	24
10	15	19	6	29
15	20	24	11	Oct. 4
20	25	29	16	9
25	30	April 3	21	14
30	June 4	8	26	19
July 5	9	13	Dec. 1	24
10	14	18	6	29
15	19	23	11	Nov. 3
20	24	28	16	8
25	29	May 3	21	13
30	July 4	8	26	18
Aug. 4	9	13	31	23
9	14	18	Jan. 5	28
14	19	23	10	Dec. 3
19	24	28	15	8
24	29	June 2	20	13
29	Aug. 3	7	25	18

AVERAGE GESTATION PERIOD—*continued.*

Time of Service.	Mares, 340 days.	Cows, 283 days.	Ewes, 150 days.	Sows, 112 days.
Sep. 3	Aug. 8	June 12	Jan. 30	Dec. 23
8	13	17	Feb. 4	28
13	18	22	9	Jan. 2
18	23	27	14	7
23	28	July 2	19	12
28	Sep. 2	7	24	17
Oct. 3	7	12	Mar. 1	22
8	12	17	6	7
13	17	22	11	Feb. 1
18	22	27	16	6
23	27	Aug. 1	21	11
28	Oct. 2	6	26	16
Nov. 2	7	11	31	21
7	12	16	April 5	26
12	17	21	10	Mar. 3
17	22	26	15	8
22	27	31	20	13
27	Nov. 1	Sep. 5	25	18
Dec. 2	6	10	30	23
7	11	15	May 5	28
12	16	20	10	April 2
17	21	25	15	7
22	26	30	20	12
27	Dec. 1	Oct. 5	25	17
31	5	9	29	21

Age at which to Breed.

It is all important that heifers shall be well developed. For this reason they should not be used for breeding too early. For Jerseys, Ayrshires, and other medium-sized breeds eighteen months old will be quite young enough. They will then be two years and three months old when they come in.

Many breeders are obsessed with the idea that heifers must be starved in rearing and then put to the bull at twelve months old to keep them fine, but the experience gained under the Standard Herd Test has already convinced some that this is an unwise policy and that they must have a well-developed animal if the returns in milk and butter are to be satisfactory. In case of the larger breeds, they may well go to twenty-one months old before being bred.

Time to Breed.

The aim should be for a cow to have a calf every year. She comes in season three weeks after calving, and every three weeks thereafter. She should not be served until nine weeks after calving. This, of course, may have to be varied according to circumstances. For instance, it is found that cows calving in early autumn give the best results. They must be provided with plenty of feed during winter, for which they will return a good profit. They will flush again with the spring growth and be dry during the driest months of summer. Again, it is not always possible to get them in calf just when you wish,

and they may then run over too long one year and have to be shortened another to get them back to the right time. Of course, cows required in bloom for a show should be served so that they will calve about the date of the show.

A cow should never be allowed to get low in condition during winter, as it takes two or three months for her to recover before she can give satisfactory returns. What should be going into the bucket is put on to her frame until she recovers normal conditions.

Care at Time of Calving.

As a heifer nears the time of calving, the udder develops and often becomes very highly inflamed and swollen, the swelling frequently extending half way along the belly in front of the udder. Farmers who have not had much experience are frequently alarmed at this. However, there is no necessity for concern, as it is a natural condition.

After the heifer has calved, she should have the udder thoroughly but gently rubbed at each milking, using camphorated oil for a lubricant. The rubbing increases the circulation and so relieves the congestion. Older animals are not troubled in the same way.

When a cow calves normally and at full time, she rarely has any trouble cleaning, as the placenta (afterbirth) comes away naturally within an hour or two after the birth of the calf. Sometimes this is not the case, however, especially in case of abortion, when ½ oz. to 1 oz. of liquid extract of ergot may be given in warm gruel.

A stimulant will also generally produce the desired result. The following has been found highly successful:—A bottle of Burgundy wine, and half a pound of brown sugar, given as a drench, repeated in five or six hours if the first dose is not successful.

As previously mentioned, during the period of pregnancy, the animal should be well nourished to enable her to develop the fœtus properly and to prepare her for the coming lactation. It is found that unless a cow is in good condition when she calves, she will not do so well as she should. If she is in very poor condition, her test will be lower than it should be; and she will not give the quality of milk she is capable of yielding until she is in normal condition.

Milk fever must be guarded against, and although this complaint has, to a very large extent, lost its terrors, prevention is better than cure. When milk fever attacks the animal, it is generally within twenty-four hours after calving, but it may attack her days or even weeks before or after. There is not so much danger with a cow that has been properly fed throughout the year as in one that has been in low condition but latterly has been on good feed and is rapidly thriving. In such a case a cow should be given a dose of salts a week or so before she calves, and should be put on short feed. The dose should be composed of 1 lb. of Epsom salts, ½ oz. of ground ginger, ½ lb. treacle, the three parts to be mixed in warm water or gruel. The mixture just given is a standard dose, and should always be given to a cow or bull on any indication of ill-health.

As soon as the cow has calved, the udder must be attended to. If the calf has sucked, it will not require feeding for the present. If not, milk the cow out dry; some of this first milk, or colostrum or biestings, is necessary for the calf. For about five days the milk will not be free

from some of this biestings, and therefore will not be fit for use for any purpose but feeding calves. It contains a high percentage of protein, and so is highly nourishing. After about five days the milk may be included in the bulk, wheither it be for city supply, or butter or cheese making.

Milking.

This should be done at regular times, and as nearly as possible at regular intervals. The cows will do better, give more milk which will not vary so much in quality as when the intervals are irregular.

To be successful, the dairyman must ever bear in mind that his motto must be "Clean and Cool," and the instructions for subsequent operations will bear this out.

"Cleanliness is next to Godliness" applies to the dairying operations, if possible, more than to anything else.

The provisions of the Milk and Dairy Supervision Act are such that the buildings, yards, &c., must be so arranged that the surroundings may be kept clean and sanitary. The need for this will be explained later. Suffice it now to say that the yards, sheds, &c., must be kept clean. Manure must be regularly cleared away, so that wind cannot blow clouds of manure dust about to settle in the milk utensils.

The cow's udder should always be cleaned before milking. To facilitate this, long hair must be clipped off. The udder must be washed with clean water. A convenient arrangement for this is an old oil drum with a tap, or better still, where it is possible to have water laid on, to have taps in convenient places to rinse the cloth out. This insures clean cloths to wash the udders with. Sometimes we see a ½-gallon billy with water that has served to wash a dozen or more cows. The consequence is that more dirt is being put on than taken off.

Having washed the udder, draw a little milk from each teat on to the palm of the hand to see if there are any clots. Should there be any clot, it is an indication of mammitis, which must be immediately attended to. If there be no indication of any trouble, take the milk away as quickly as possible.

Should a cow be "tough," take the end of the teat between the palms of the hands and rub gently for a moment, this eases the sphincter muscle at the end of the teat. Milk full-handed when possible, and squeeze well, otherwise an easy cow will become tough. Short-teated cows that have to be milked with the finger and thumb are a nuisance, and, no matter how good, a bull from such a cow should never be used. Having got all the milk that can be drawn by using both hands, it is necessary to milk with one hand while the quarter is squeezed and manipulated with the other, so as to work out the strippings from pockets and interstices that exist. In some cows, quite a lot of milk is retained and has to be removed in this way. It must be remembered that the strippings are practically cream, and greatly improve the test. Besides, if the cow be not milked dry, she will tend to gradually dry off.

Cows should be milked twice daily until they are within two months of calving, when they may be milked once daily (unless giving a big quantity of milk) for a while, then every second day, and later twice a week until dry.

Care must be taken to have the udder quite clear before turning out, especially in summer time, or the loss of a quarter may be the result.

A heifer in her first lactation period should be kept milking, even if she is only stripping, until within six or eight weeks of calving again.

Secretion of Milk.

How does a cow produce milk? To fully understand the care and management of the dairy cow we must know something of the physiological process by which she converts the food she eats into milk. We see elsewhere that the food is composed of soluble or digestible and indigestible constituents. The soluble ingredients are composed of—

(*a*) Protein, which is the flesh forming part of the food, from which the whole of the cell system of the body is manufactured and built up.

(*b*) Carbo-hydrates which form the heat and energy necessary for the cow to carry out her function in life.

(*c*) Fat or oil which is also used principally for heat and energy production.

When the cow takes food into her stomach, it is masticated or ground up and mixed with digestive juices secreted by the glands and cells of the stomach and intestines. The soluble part of the food is dissolved, absorbed into the blood, and conveyed to the different parts of the body for its nourishment.

The body of the animal is composed of a mass of cells. These cells are so small that they can be seen only under a microscope. They are like soft-shelled eggs, consisting of an envelope containing albumin, or protoplasm as it is called. This albumin is the life principle of the animal, and has the power of absorbing from the blood the different constituents it requires for its nourishment. For instance, the cells of the bone absorb phosphate of lime and nitrogen from which the bone is manufactured. When a calf is born there is practically no bone in its body. What serves for bone is gristle or cartilage. The cells of the muscle absorb what is necessary for the making of muscle, and the cells of the udder absorb what is required for the manufacture of milk.

Every one knows that the large veins running from the udder along the belly and disappearing about half-way along, are called milk veins, and even now many people think that they convey milk from the stomach to the udder. Large milk veins are certainly an indication of a cow's capacity to give a heavy yield of milk, because they convey a large amount of blood from the udder back to the heart, whence it is pumped to the various organs to be purified of the refuse picked up in its passage through the udder. Large milk veins indicate a large arterial system laden with fresh food juices from which the cells of the udder manufacture milk.

The udder consists of four quarters, with a partition from front to back, completely separating the two quarters on the left side from those on the right. There is not the same definite division between the front and hind quarters on each side. One quarter of the udder can, perhaps, be compared to a bunch of grapes. A bunch of grapes is held to the vine by the main stalk. This may be compared to the teat. The main stalk branches off into smaller stalks, these again into smaller stalks at the end of which is the grape. The teat of the cow's udder branches off into branches or tubes or ducts as they are

called. These branch off into smaller ducts, and so on until they terminate into grape-like bodies lined with cells, which absorb from the blood what is essential to the making of milk.

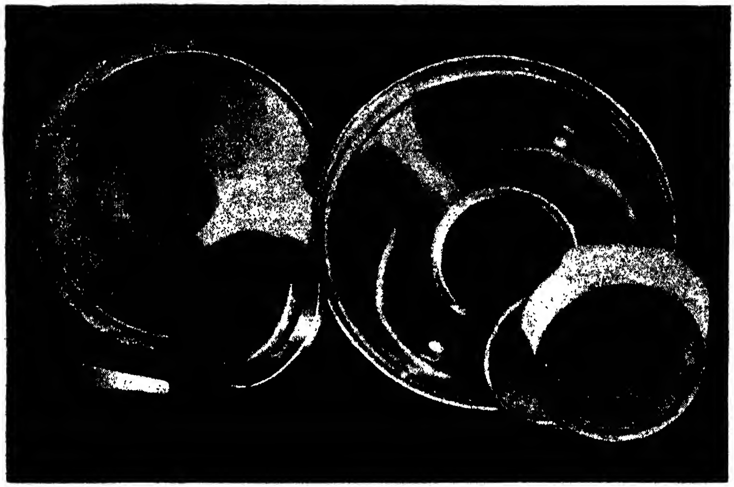
In a bunch of grapes there are spaces between the individual berries, but in the udder these spaces are filled with elastic and connective tissue which expand and contract as occasion requires, and hold the udder in shape and position. In a good class of udder the connective tissue is reduced to a minimum; thus when a cow is milked out dry the udder is like an empty glove or squeezed out sponge. The cow then goes out to feed, and gradually the udder fills up until milking time arrives again, when the udder is again full, but not of milk. If the udder of a cow in full milk were cut open, there would be revealed a cavity holding about half a pint of milk at the top of each teat; the rest of the udder would be shown to consist of flesh with minute droplets of milk oozing out of the ducts which have been cut. What takes place when the cow goes out to feed is that the cells absorb what they require for their nourishment. When a cell is fully nourished it splits right through the middle, and each half develops into an independent cell; these in turn divide, and so on until the udder is full of these cells or flesh as it really is.

What converts this flesh into milk? Through the whole body runs a network of nerves. If a human being sticks a pin into any part of his body, he will feel it, because it comes into contact with nerves. If he squeezes his finger he feels it, because he communicates with the nervous system. Squeeze a cow's teat and her nervous system is communicated with, and the nerves of the udder break down the cells and manufacture milk. This continues as long as there are any cells in those grape-like bodies to be broken down. When there are no more the cow is milked dry. The reason that the strippings are so much richer than the first milk is that some of the large fat globules become caught in some of the small ducts, and have to be worked out by manipulation.

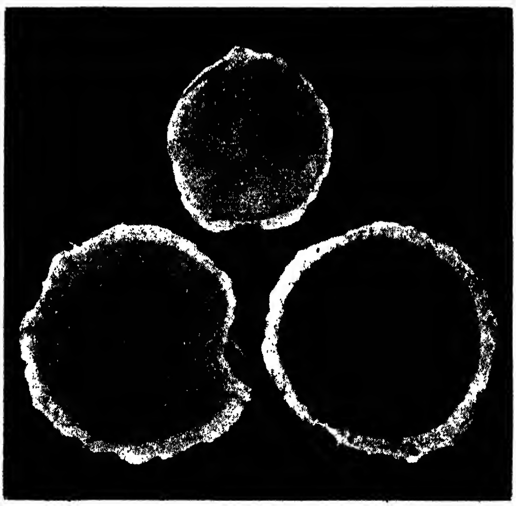
Now, anything that upsets the nervous system directly affects milk secretion. Often we sit down to milk and get half a pint or so from each quarter, and then no more, although there is a bag full. We say she is holding her milk. It is not that she is holding it, but that her nervous system is in such a disturbed condition that it cannot act normally and produce the milk from the material stored up in the udder for the purpose. This shows how necessary it is to handle the cows in such a way that their nerves may not be disturbed. It is easy to understand, therefore, that if a cow be treated to a few blows on the ribs with a milking-stool, or given a kick in the belly or be chased by dogs, her nerves will not be in a condition to enable her to give the yield of milk she is really capable of.

Straining the Milk.

Although every care may be taken to keep the cow yards and sheds clean, the cows groomed, the hands of the milkers and the udders and teats of the cows washed, it will still be impossible to prevent particles of dust, scurf, hairs, &c., from falling into the milk. With ordinary milk strainers only the large particles are prevented from passing from the milk bucket into the cans. In addition to the usual wire gauze, therefore, two or four folds of butter cloth should be used.

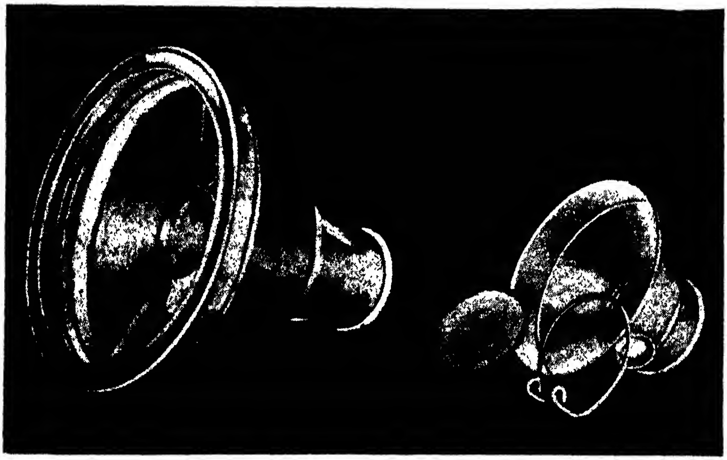


Large Size Milk Strainer.



The above illustrations show the effect of the improved strainer on milk. Fig. 1 is a disc of cotton wool before use, and Figs. 2 and 3 are discs through which 40 and 20 gallons of milk respectively have passed, and it will be seen that the last is very much the dirtiest. Both lots of milk had previously been run through five strainers, two of which were muslin.

Great care, however, must be observed to keep this muslin clean. The best way to do this is to rinse it out with cold or tepid water, and boil it in water in which a little washing soda has been added. To insure cleanliness a good strainer must be used. A very good one on sale consists of wire gauze, and of a wadding disc which is burnt after use, a new disc inserted for each milking. Usually about 40 gallons will pass through the disc before it will require changing. This reduces the risk of contamination through the strainer not being clean and sweet. Unfortunately, there are still some people who consider straining unnecessary, because the milk is only for the factory or creamery, or going to be separated. They fail to realize that as some of the impurities may have been dissolved by the time it reaches the separator, it is then too late to attempt to arrest the taints imparted to the milk, and all that can be done is to detain the coarser particles which may still be undissolved.



Milk Strainers Stamped Out of One Piece.

Utensils.

Most of the utensils used in connexion with milk and cream are made of iron or steel coated with tin. Poor quality cheap utensils have a very thin coat; in fact, the iron is not completely covered. If examined closely under a glass pin holes or bare patches will be seen. In use these bare spots become attacked by the oxygen of the air, and rust is formed, which gradually spreads under the tin coat causing it to peel off, so that the cream is in direct contact with the iron. As the cream ripens acid is formed which attacks and dissolves the iron giving to the cream the well known metallic flavour, causing it to be graded as second class. This would mean an immediate loss to the supplier of 1½d. per lb. If a can contains, say, 40 lbs. of butter fat, the loss due to the rusty can would amount to 5s. It would not take long to pay for a new can if that could be saved. If the rusty

iron be examined under a magnifying glass it will appear honeycombed, and all the crevices filled with filth, as it is practically impossible to clean it. This becomes a source of contamination which may result in the cream being graded below second, in which case the loss would be sufficient to pay for two or three new cans. Only good quality cans should be purchased in the first instance, and immediately these show signs of the tin being worn off, they should be retinned. In this way a good quality can may be made to last a lifetime. Cans with galvanized iron hoops should not be used, as they cannot be retinned.

Cleaning Utensils.

From what has appeared above it will be seen that the proper cleansing of the utensils is very important. After a utensil has been used for milk, it should be rinsed with cold or tepid water to wash off the milk. Scalding water should not be used first, because milk contains albumen, which, like the white of an egg, coagulates when it comes in contact with boiling water. This would form a coat of shine in which putrefactive bacteria would develop and inoculate the next lot of milk or cream put into the vessel. First rinse out the milk, then scrub well with hot water and washing soda. This cleans all grease and dirt away. Finally rinse with boiling water, and turn upside down to drain and dry. If a boiler is in use give the utensils a good steaming. If the utensils are not properly cleaned a yellow shine will gradually form, especially round the seams.

(To be continued.)

FLOATING CURD IN CHEESE-MAKING.

By G. C. Sawers, Cheese Expert.

Where stringy, floating, or badly-flavoured curd is met with, faulty milk is invariably the cause. A simple and practical means of testing milk suspected of being liable to yield floating curd is as follows:—

Carefully wash out and steam a number of pint glass jars. Place a sample from each supplied in a separate jar, filling it three-fourths full. Place the jars in a tub or trough of warm water until the milk is brought to a temperature of 98 degrees F. (The thermometer should be thoroughly cleaned after taking the temperature of each sample, otherwise pure samples may be contaminated). Then stir ten drops of rennet into each sample. When the milk coagulates, the curd may be cut with a sterilized knife, and the whey drained off. The water surrounding the jars should be kept at 98 degrees for the next twelve hours. When the curd is cooked, it should be cut through the centre with a sharp sterilized knife, and carefully examined for holes, sponginess in texture, and bad flavour.

Throughout the test, the mouth of each jar must be covered with a damp muslin cloth that has been scalded beforehand.

NAURU AND OCEAN ISLAND.

Reduced Price of Phosphate.

By Harold B. Pope, Commissioner for Australia.

In a report by the writer, recently published by the Commonwealth Government in booklet form, the following foreword appeared:—

> "The greater part of the information contained in the following pages appeared in the *Journal of the Department of Agriculture of Victoria,* in August, 1921, and March, 1922. A few touches of local colour are now added, in addition to which reference is made, at the end of the article, to the reduction in the delivered price of phosphate to the Australian manufacturers, which is to take effect on and from the 1st July, 1922."

As only a limited number of the booklets was printed, and as many readers of the *Journal* may not have had the opportunity of perusing it, the writer proposes to here repeat his closing remarks regarding the reduction to the Australian manufacturers of the Nauru-Ocean Island raw material, which came into operation on the 1st July last. The remarks were as follows:—

> "The delivered price in Australia of the Nauru-Ocean Island raw material for some time past has been from 75s. to 80s. per ton. Current contracts at these prices expire, however, on the 30th June, 1922. For the year commencing 1st July, 1922, the delivered price to the Australian fertilizer manufacturers for Nauru and Ocean Island phosphate will be reduced to not more than 55s. 6d. per ton in the Eastern States, and 58s. 6d. in Western Australia, and an effort is being made by the Commissioners to bring these prices still lower. The Australian manufacturers, in undertaking to pass on this reduction to the farmers, have agreed to the insertion, in their contracts with the Commission, of a clause by which the selling price of the superphosphate sold by the manufacturers shall be adjusted by them in such a manner that the consumers of superphosphate in Australia will have the benefit of any saving in the cost of manufacture arising from the purchase of the Nauru-Ocean Island raw material.
>
> As already stated, 1 ton of phosphate, after being treated and mixed with sulphuric acid, makes nearly 2 tons of superphosphate. It therefore follows that a reduction of at least £1 2s. per ton of phosphate equals a reduction of about 11s. per ton on superphosphate. In justice to the fertilizer manufacturers, it must be mentioned that they will have large stocks of phosphate on hand at the dearer prices on the 1st July, 1922, when the reduction in the delivered price of at least £1 2s. per ton takes effect.
>
> It is impossible to say, at this stage, exactly what further reductions in the price of Nauru-Ocean Island raw material are likely to take place in the future, but when the proposed cantilever is erected, the f.o.b. cost should be considerably reduced. The delivered price is, of course, influenced by freight rates. The fluctuations in these have been mercurial at times in the past, and it is partly

with a view to stabilizing Australasian freights that the Commissioners have decided to take advantage of the present slump in shipping (at the moment of writing, new and suitable steamers can be bought at less than one-third of their original cost) to buy one or two ships for their own use of a special type suited to the requirements of the trade. With an assured annual demand for, say, 300,000 tons in Australia and New Zealand, these vessels would never need to be idle.

In reducing, as far as possible, the price of their raw material to the Australian manufacturers, and in making ample provision for any saving thus effected to be duly passed on, the Commissioners have done all in their power to reduce the price of superphosphate to the farmers, who, so far as their future supplies of cheap and high-grade superphosphate are concerned, can now view the future with equanimity and satisfaction. The more our farmers use superphosphate, the less it is likely to cost them."

Since the foregoing was written, the further foreshadowed reductions in the price of the Nauru-Ocean Island raw material have come into force. Instead of the delivered prices being 55s. 6d. per ton in the case of the Eastern States, and 58s. 6d. per ton in Western Australia, they are now 49s. 3d. per ton, and 52s. 3d. per ton for Eastern and Western Australia respectively. These further reductions also took effect on and from the 1st July, 1922.

The pre-war delivered price of Nauru-Ocean Island phosphate in the eastern States was 46s. 3d. per ton. This was the contract price in contracts extending over a number of years, which were made when freights were very cheap. Judged from the present-day view-point, current freight rates from Nauru and Ocean Island to Australia are low, though they are still about 6s. per ton higher than when the pre-war contracts at 46s. 3d. per ton were made. Taking this into consideration, and bearing in mind that the Commissioners' costs are—as practically everywhere else—about 50 per cent. higher than were the Pacific Phosphate Company's costs in 1913, it is clear that the Nauru-Ocean Island phosphate industry has been one of the very first to right itself in this country. In pursuance of the above reductions in the delivered price of the Nauru-Ocean Island raw material to the Australian manufacturers. considerable reductions in the price of superphosphate have been made. The average Australian price for 36 per cent. superphosphate is now about £5 5s. per ton, as against the pre-war average price of about £4 7s. 6d. per ton, or an increase of, say, 20 per cent., whereas most other commodities are still nearly 50 per cent. higher in price than before the war.

From letters received, it would appear that some farmers are under the impression that the Commissioners are responsible for the price of superphosphate. In so far as the delivered price of the Nauru-Ocean Island raw material enters into the cost of the manufacture of superphosphate, the Commissioners are responsible; but it should be clearly understood that at this point their responsibility ceases, as other factors entering into the cost of manufacture, such as the price of sulphuric acid, labour, grinding and mixing, bags, overhead charges and distributing costs, fall neither within their jurisdiction or control.

MILK FEVER.*

Milk fever generally occurs within three days after calving, although it may come on before calving, or several weeks after. A short time after delivery the cow shows signs of restlessness, raising first one hind foot and then the other, breathes a little more quickly, does not like movement, and if caused to move staggers in her gait, losses her appetite, ceases to chew the cud, and has a staring look in the eyes. The hind limbs give way about twenty hours after onset of disease, the animal falls, and remains down. The eyes now protrude, and may be insensible to the touch; there is general loss of sensation and voluntary movement. The head and horns are more or less cold to the touch owing to a withdrawal of blood from the brain. The animal may be delirious and dash its head about, in which case it must be prevented from hurting itself by padding with bags of straw and chaff, and kept in a sitting position. The animal may become comatose, with head bent towards the shoulder, cannot swallow, bowels do not act, urine remains in the bladder, becomes blown up with wind, more and more comatose, and at length dies.

As soon as it is seen that anything is wrong with the health of the animal, the following dose should be given;—16 ozs. of Epsom salts, ½ lb. treacle, one tablespoonful of ground ginger, in about a quart of warm water or gruel. (This should be given to any cow at any time showing signs of ill health.) The animal should be kept warm with rugs or bags, cold water may be applied to the head, the spine rubbed with a liniment composed of liniment of ammonia, one fluid part, and compound liniment of camphor, one fluid part, or a paste of mustard and turpentine. Half a pint of spirits should be given occasionally as a stimulant (say every three or four hours); methylated spirit will do for this, and is much cheaper than anything else.

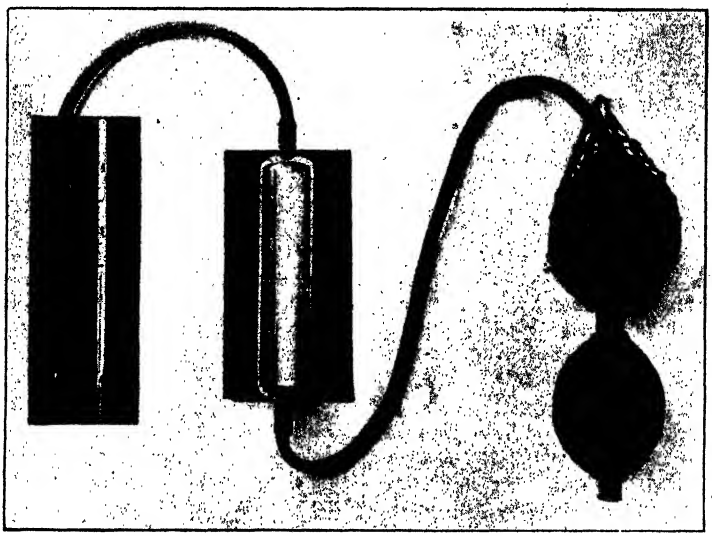
The womb should be flushed with a 2 per cent. solution of lysol by means of a piece of hose pipe passed in by hand. The temperature of a cow in health is 101-102 degrees; in case of milk fever it will be below this, and in other fevers above, and this is an infallible guide as to the nature of the disease, and will distinguish it from a form of blood poisoning, sometimes a trouble at calving. If the cow is insensible, medicine should be given by pushing a piece of hose pipe down the throat into the stomach, and the medicine poured down this direct into the stomach, otherwise it may get into the lugs and either choke the beast or cause inflammation of the lungs. This will also let the gas out of the stomach.

Of all the known methods of treating milk fever, the injection of sterilized air into the udder is by far the most simple and practicable, as well as the most efficacious and harmless one yet tried, and only occasionally requires the concurrent use of medicinal treatment. At the milking herd trials at the St. Louis World's Fair some years ago the Jersey herd competing numbered 41 cows, and 21 of these were down with milk fever. All were saved by air being pumped into the udder

* Reprinted, with some alteration, from the *Year-Book of Agriculture*, 1905.

by a bicycle pump. No medicine was administered internally. The method of injecting the sterilized air into the udder is easy of manipulation, requires but little time, and is readily accomplished by means of a milk-fever apparatus, illustrated below. It consists of a metal cylinder, divided in the centre, one end screwing into the other; a small nozzle at each end, which is inserted into rubber tubing. The cylinder is filled with sterilized wadding. A bicycle pump or an enema is attached to one end by means of 9 inches of rubber tubing, and a milking tube to the other by the same means.

Previous to making the air injection the hands should be thoroughly cleansed, also the udder. Soap and water should be applied to the teats and udder, a clean towel spread underneath to prevent the teats coming in contact with dirt, then they should be carefully disinfected with a 2 per cent. solution of lysol. About a wineglassful of the lysol



Milk Fever Apparatus and Veterinary Thermometer.

solution should be injected into each teat. This will sterilize the ducts of the teat and prevent the introduction of germs that will cause inflammation of the udder. The lower part of the cylinder, the tubing, and milk tube must be sterilized before using for injection. This may be done by soaking in the lysol solution, or by boiling for fifteen minutes and not allowing it to touch anything until inserted into the teat. It is then carefully inserted into the teat after withdrawing the milk. The air is now pumped from the bulb or pump and a continuous flow of air is forced through the filtering chamber and into the udder. Slight rubbing or kneading will cause the innermost recesses of the milk ducts of the udder to be distended with the injected air. After the quarter is

well distended and sufficiently tense, the milking tube is removed, care being taken to prevent the outflow of air by having a broad piece of tape tied round the teat when the milking tube is withdrawn. The same treatment is repeated in the other three teats until the udder is satisfactorily distended. Should the air become absorbed and no improvement is noted, the treatment should be repeated in two or three hours, taking the same antiseptic precautions as at first. The tape should be removed from the teats two or three hours after the cow gets on her feet. A cure will just as certainly be effected by simply pumping air into the udder by means of the bicycle pump or enema and milking tube, but the risk of introducing septic or blood poisoning germs is considerable, hence the adoption of the antiseptic precautions recommended above. Prevention is better than cure, and if the cows are given a dose of salts and kept on short feed for a week or so before calving there will not be much danger. The greatest danger is with cows that are full blooded and rapidly thriving, more so than with fat animals.

THE WORLD'S YIELD OF WHEAT.

The International Institute of Agriculture at Rome reports that an exact estimate of European wheat production in 1922 cannot be made until the figures from France, Germany and the Serb-Croat-Slovene State become available. It is, however, certain that this year's wheat crop from all Europe (apart from Russia, whence no trustworthy data are yet to hand) is decidedly less than that of 1921. As regards those European States which have already furnished particulars, the Statistical Bureau of the International Institute of Agriculture estimates the decrease in yield, as compared with 1921, at 13 per cent. It is also announced that the yield of breadstuffs (wheat, rye and meteil) in Prussia shows a decline of 21.6 per cent., and that threshing results in France indicate that the production of cereals is below that of 1921 and in some districts under the average.

Poor results are manifest also in North Africa, where Algeria, Egypt, Morocco and Tunis have wheat crops amounting to 68 per cent. of last year's.

The good returns of India, Canada and the United States have provided 42.8 million metric tons of wheat this season, or 17 per cent. over those of 1921. The European deficiency and that in North Africa is thus compensated, and it appears probable that the wheat yield of the whole northern hemisphere will, at the very least, prove equal to that of last year.

STOCK IMPROVEMENT.

Where Breeders should Co-operate.

(By J. S. McFadzean, Senior Dairy Supervisor.)

A very large portion of the wealth of Australia is derived from stock and stock products, but the majority of those who make their living from stock-raising are not breeders in the true sense of the word. More usually they work with store stock purchased in the markets, and of whatever class may be offering when grass is plentiful; and should they desire to raise young stock of a better grade they are dependent on a comparatively small number of breeders, who keep pure-bred studs to supply those selected sires that are necessary for such improvement in flocks and herds. Individually, these breeders of pure stock are most progressive people, and their work is of great value to the country. As a body they lack that unity of purpose which is essential to the full advancement of their interests.

In either appearance or utility, pure-bred stock are very much superior to grades or crosses. Consequent on having been selected closely on definite lines over many generations they are more even in both their conformation and production, and the longer each line of breeding has been maintained, and the more rigid the selection exercised. the higher quality is to be found in them. This superiority of pure-bred stock is so marked that only those absolutely wanting in business method disregard its advantages, and to breed stock from any but selected pure-bred males is a display of either ignorance or gross carelessness.

Every step towards more pure-bred stock being raised, and a corresponding reduction in regard to the use of cross-bred and mongrel males, is a national gain, for thereby the acre-production of the land is being increased. The all-round higher market value of well-bred stock is in itself public recognition of superior quality, and is sound reason for encouraging it. Increasing the grass-growing or fodder-producing power of land is frequently mentioned as a most laudable objective, but it is equally important that all grass and fodder should be turned to best account by raising thereon the best grade of stock. It should, therefore, be the constant endeavour of every one who takes an interest in primary production—and all should—to have more improvement in stock-breeding made each year. This will be effected by breeders maintaining their exacting selection in regard to their stud animals; but they require all the support that can possibly be given them by concentrated effort of themselves and others towards the ultimate elimination of the practice of using sires which are not pure-bred and are of inferior type.

Official recognition of the value of pure-breeding in all classes of stock has been made through assistance given to Agricultural Societies by the Government to enable them to carry on their avowed object of stock improvement. Very few of these societies, however, do anything more in this direction than to hold an annual show, at which prizes are given for the best stock exhibits. Almost every breeder of pure stock is a member of such a society, but, broadly speaking, it does little

to assist him. Each of these societies is dependent on the stock-breeders to make a success of the annual show, but in no instance has any of these societies a regulation which requires that its other members should support the breeders by using none but pure-bred sires in their flocks and herds. In numerous cases, members will actually be found to be using mongrel sires. In example alone it will, therefore, be seen that there is much room for improvement. Members of these societies should, without exception, be the progressive agriculturists of their several districts. At present, while some maintain a continuous campaign for stock improvement and are doing valuable work in that line, others take no interest in this important objective of their colleagues, and by careless stock-breeding methods are retrograding instead of progressing. There is much room for co-operation here.

Amongst the pure-stock breeders themselves, a point which calls for serious attention is the fact that they have one common objective, no matter what class or breed of stock they are working with. Usually, each subscribes to some association formed to look after the special interests of one particular breed, and while giving attention to this, the necessity for unity amongst all breeders is overlooked. Concentration on their individual work frequently appears to have narrowed their outlook in this direction. Those who are handling other stock are too often looked on as no more than competitors in regard to sales, and a feeling of antagonism is allowed to obtrude. Consequently, in the endeavour to gain ascendancy in trade, all opposition breeds are discredited, and reciprocation of this attitude shuts off any possibility of mutual interchange of ideas to the disadvantage of both parties.

This state of affairs between breeders is not at all uncommon, and it is only want of thought which causes them to forget their interdependence, and that they are striving towards the one main objective. Even if their lines of working are apparently in opposition it is the education of those who are now handling inferior stock so that they may appreciate the advantages of pure-bred animals, that should be the first consideration. Every breeder of pure-bred stock who in the hearing of a prospective buyer deliberately finds fault with another breed is in some measure defeating his own purpose. All know that pure-bred stock are superior to cross-breds or mongrels on account of their more even type and higher average utility; and to make statements to the prejudice of a rival breed tends rather to create suspicion regarding both than to beget confidence in the one favoured.

Breeders should study to praise their own stock as high as is warranted, but they will be well advised to put in some good word for, rather than an adverse remark on, any and all others. All pure-bred stock will at least reproduce their good quality, and with them reasonable selection will insure speedy improvement; but with cross-breeding no assured headway is possible. Only under a settled line of working can there be definite advancement; and only by the use of pure-bred males can a system of improvement be established. While every breeder should be working with that particular line of stock which is best suited to his surroundings and requirements, he should not be blind to the good points of other breeds, for no one of them has a monopoly of every good feature. Each has some outstanding quality which it may well be given full credit for. Whatever are the advantages of each pure breed, it is

to the interest of every breeder of other stock to know these points, and show their co-operation by putting them forward whenever suitable opportunity offers.

Instances occur where breeders are apparently so fearful of opposition that they freely find fault with animals bred by another, even when these are stock of the same breed as they themselves are handling. When this takes place the other owner is certain to soon hear of it, and the feeling of mutual distrust which will ensue will not be to the advantage of the owners, and at least some harm will have been done to the breed. No breeder should under any circumstances allow himself to make adverse comment regarding animals of his own special breed. Where no good features of another breeder's stock cannot well be brought forward, it would be much better to avoid an awkward question by a plea of being unacquainted with the strain than to be intrigued into saying something which will certainly sound more like prejudice than good judgment, and may do an injustice to the breed generally. Praise of a supposed rival's stock will place that of the breeder on a much higher standard than fault-finding. It is better that his stock should be superior to good stock than to those of mediocre quality. Breeders have repeated opportunities for helping each other, and a mutual feeling of co-operation is to the benefit of all.

There is very much to be learned in stock-breeding. The experiences of any beginner may be useful to even a long-established breeder. No one knows all the points of the breeder's art, and it is from the observance and study of mistakes that success is frequently achieved. Amongst beginners an interchange of experiences may be particularly instructive, and it is always beneficial to have some one interested in the breed to compare notes with. Friendly criticism of one's stock also tends to eliminate any obsession regarding their excellence, and the owner's knowledge of the breed is thus broadened.

At the same time, there is every reason why each breeder of any class of stock should look upon his own breed as the best. It would be a pity if it were otherwise, for only when this idea prevails will the full possible results be obtained from them. The choice of breed is made with some definite object, and the decision rests on that one which appears most suitable under the various conditions. If sound judgment is exercised in the first choosing, only under a change of surroundings or working conditions is it likely that a change of breed will be justified. Each owner may therefore be considered to be handling the breed best suited for his purpose. Having made his own choice, he should be able to grasp the various points of estimate in others, and he should be at least tolerant towards those who have chosen on other lines.

Difference of choice may even be of much advantage between neighbours in generating a spirit of emulation, and certainly should not give rise to antagonism. Working with different breeds, neighbours will have the opportunity of watching the results obtained by each other, and of getting a better insight into the comparative quality of the stock. On the other hand, if neighbours are working with the same breed the advantages to both are increased. There is certain to be variation in their lines of management which will be instructive to both. If they happen to be pioneers of their breed in the district, better headway will be made together than one could attain. More

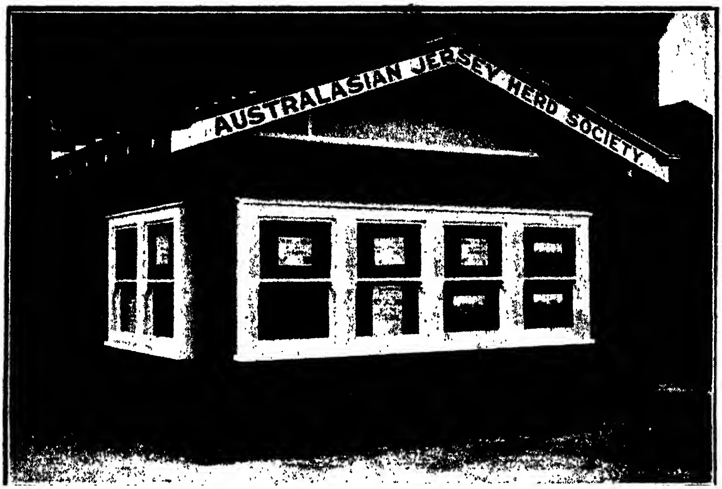
interest will be centred in the breed through their mutual choice of it, and more weight will be given by onlookers to their combined opinion of the breed than would be accorded to that of a single individual. By competition at local shows, several exhibitors attract additional attention, especially from those likely to buy.

As stated previously, jealousy amongst breeders mainly arises through eagerness in trade competition, but experience soon shows that competition makes trade. Instances can be seen of really good breeds of stock which, in the hands of only one or two breeders, make little headway. This is because their good qualities do not come up for discussion to the same extent as would happen if several breeders were competing with one another. For this reason, old-established breeders should always welcome younger or newer ones. They are admirers and buyers of the same breed, and they will also be advertisers of it. Every way in which a new breeder advances his stock, whether by printed advertisement or by show-ring publicity, he is indirectly benefiting all older breeders. They should encourage him in his work, and never speak disparagingly of his efforts. They could always well spare a word of praise wherever the occasion offers, and coming from those long-established, it is certain to be appreciated.

Another line along which breeders are able to assist each other is in the direction of universal publicity. By owners working together each particular breed can have its utility points brought under special notice in a way that individual breeders cannot possibly carry out. A very striking instance of this has recently been seen in regard to dairy cattle in this State. For many years past the breeders of Ayrshire and Jersey cattle have had associations which issued herd books containing particulars of the breeding and the Show records of their stock. These were circulated amongst the members of each society and a few other people and firms closely interested in stud breeding. These two breeds had also been well represented at agricultural shows throughout the State for some forty years past, yet there was no spcial boom with either in regard to dairy work. Milking Shorthorn, Friesian, and Red Poll cattle had also been shown for years past without attracting any special attention from dairymen, and until recently these breeds were not represented here by any society, and consequently even had no herd book. With the inauguration of the Victorian Government herd-testing system in 1912—which was mainly brought about by breeders of Jersey cattle —it became necessary for all cows competing to be registered in a herd-book, so with the three last-named breeds associations had also to be formed and particulars of breeding recorded.

The results of each year's herd tests were published in this *Journal of Agriculture,* showing the comparative excellence of individual cows and of the best of the herds. Following on this there was usually a few comments in the newspapers as to the results, and that was all the publicity this most important work obtained. Pure-bred cattle were being systematically tested for their utility qualities, but those for whose direct benefit the work was undertaken were not in touch with it, and the results were far short of the anticipations of those who initiated the scheme. Again, it was the breeders of Jersey cattle who first recognised this to the extent of planning to improve it. By doubling the annual subscription of the members in their society, they provided

a fund for advertising the merits of their breed on general lines. In 1918, all the herd-test records of the breed in the Victorian tests to that date were compiled; and, published in illustrated booklet form, these were circulated throughout the State. By means of paragraphs in the weekly papers, attention was also drawn to these records and to the high dairying qualities of this particular breed. Two years later, a second edition of these records was issued, the publicity work being meanwhile continued, and advertisements were also placed in the press drawing attention to the breed generally. By this time the work was showing results in increased sales of stock for dairying purposes, and breeders of other cattle had the subject forced to their attention through the demand created for Jersey cattle. The Associations representing Red Polls and Ayrshires have consequently both published the records



Jersey Herd Society's Kiosk at Royal Agricultural Society's Show Grounds.

made by their cattle in these herd tests; and with the Friesian breeders, have also put special effort into press publicity. At this year's Melbourne Royal Show, the Jersey Society made another innovation on this same line by having a permanent kiosk erected there for the purpose of distributing information about the breed. This kiosk gave members a place of meeting where they could be found by those desiring to inspect their stock; and as the kiosk was in charge of a member of the Society throughout the whole of the Show week, every one wanting information regarding Jersey cattle could there obtain it fully. In all probability, this line of working will also be followed in future by other societies.

The direct result of all this is a widely increased interest by farmers in pure-bred dairy cattle, which was the objective the Government had in view when the herd-testing scheme was inaugurated. The publicity given to the results of the tests has aroused interest in them all over the State. Hundreds of dairy-farmers are now comparing the yields of their

own cattle with those of the pure-bred stock being tested under Government supervision, and the results are all in favour of the pure breeds. Wider use of pure-bred bulls for breeding dairy cattle is resulting, and higher dairy returns will follow with benefit to all concerned. No one can give consideration to this subject without acknowledging the advantages to the dairying industry of this publicity work begun by the Jersey Society. Their work has indirectly benefited all other dairy breeds through stimulating a competitive spirit amongst owners, but most of all by so extensively drawing attention to the superiority of pure-bred stock. The whole is the result of co-operation.

Unity and loyalty amongst breeders are absolutely imperative in the interests of all. Progress will be hindered in its absence. That all pure-stock are better than those of mixed or indifferent breeding is the point that each breeder should be continually making known, and the excellence of the particular breed that each is working with will then be much more easily emphasized. Open rivalry amongst breeders is good, as the resulting emulation makes for progress; but behind it should lie that true spirit of co-operation which is so essential to universal progress. Unity is strength, and more unity of purpose amongst breeders of all classes of stock along the lines indicated would be for their individual as well as mutual benefit.

WEEDS AND THEIR ERADICATION.

(Continued from page 606.)

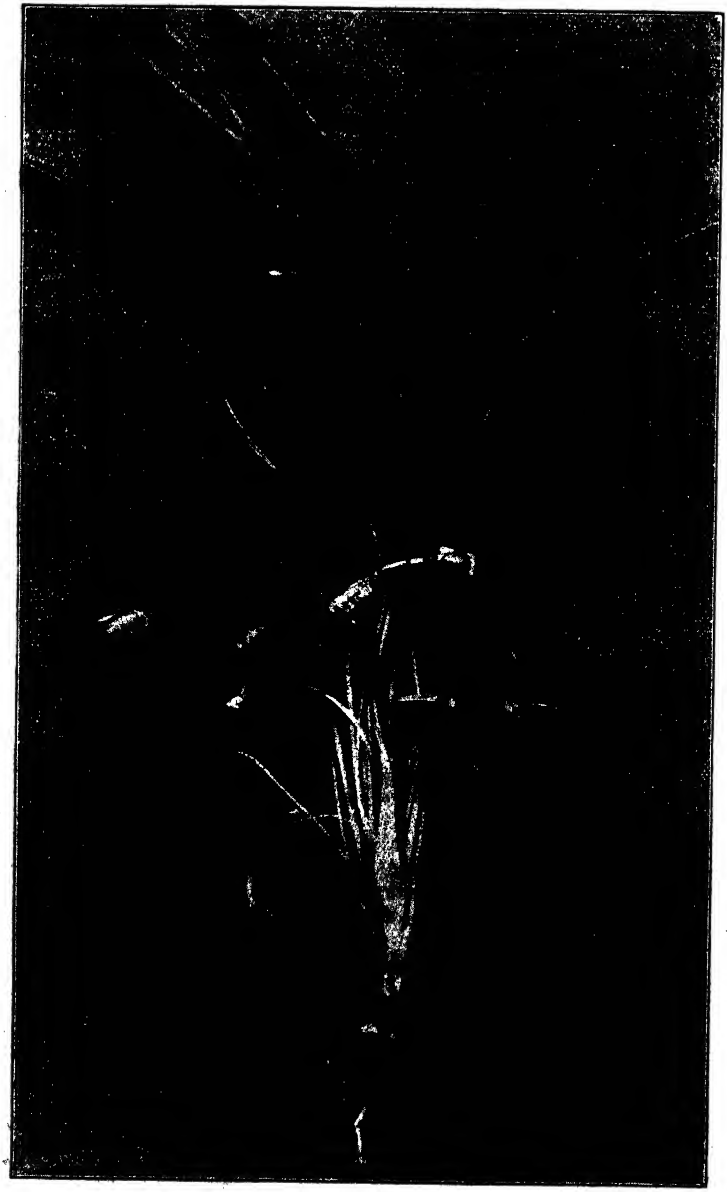
By H. W. Davey, F.E.S., Orchard Supervision Branch, Department of Agriculture.

Onion Grass or Guildford Grass (*Romulea cruciata*).
Family: *Iridaceæ.*

There appears to be with many people, a certain amount of confusion between the plants known as Onion Grass and Onion Weed. The former (Fig. 49) belongs to the *Iridaceæ*, to which family also belongs the weed known as Cape Tulip (*Homeria collina*), both of which are natives of Africa, while the Onion Weed belongs to the family *Liliaceæ*.

Onion Grass is a bulbous plant, from which arise seven to twelve, or even more, grass-like leaves, which are slightly grooved on each side. The flowers are of a purplish-pink colour, and are usually from three to five in number.

Like other bulbous weeds, Onion Grass is a difficult plant to eradicate once it has become well established. It delights in hard, compacted soils in exposed situations, which is a reason why it thrives so well on roadsides in so many parts of the State. It dislikes loose soils, and cultivation should be practised wherever possible. In addition to increasing by means of corms every year, it is also a fairly prolific seeder; the seed is carried about by stock, and in this way is spread over very large areas. Cockatoos may often be seen feeding on Onion Grass, and where these birds are plentiful, they doubtless afford some check to its increase.



Onion Grass, *Romulea cruciata,* **carrying nearly ripe seed.**

Onion Weed, ***Asphodelus fistulosus, L.,*** **carrying seed vessels.**

Where cultivation is possible, it should be carried out, as this is the best and surest means of getting rid of the plant.

When Onion Grass occurs in lawns, as it often does, frequent close cutting will kill it. Its vitality is shown in its being able to force its leaves up through asphalt paths, in cases where the corms are not removed before the work of asphalting has been carried out.

Onion Grass is proclaimed for the whole of Victoria.

Onion Weed (*Asphodelus fistulosus*, L.) Family: *Liliaceæ*.

This native of Southern Europe is a perennial; it has cylindrical hollow leaves, which give it somewhat the appearance of onion or shallot stalks. It has long fibrous roots. The flowers are numerous, and of a pinkish-white colour. It is a useless species, being rejected by stock; in consequence, it has become very prevalent in many parts of Victoria, and, if left uncontrolled, soon takes possession of the ground.

Onion Weed (Fig. 50) increases both by seed and offsets, but can be easily suppressed by cultivation. On grazing land, its control becomes much more costly, necessitaing the plants being either hand-pulled or hoed out, and collected and burnt. These operations are best carried out when the plants are flowering, as at this time the majority of weeds are most easily injured, and this applies particularly in the case of Onion Weed.

Onion Weed is proclaimed in the following municipalities:—Queenscliff, Bellarine, South Barwon, Port Fairy, Swan Hill, Maldon, Warrnambool, Flinders, and Karkarooc.

(*To be continued.*)

WORLD'S PRODUCTION OF BEET SUGAR.

The International Institute of Agriculture is now in possession of practically complete data as to the production of beet-sugar in the European countries and in the United States during the season ended 31st August, 1922.

From these data the total production of Europe and of the United States is estimated at 4.8 million metric tons of raw sugar, showing a 6 per cent. increase over the corresponding production of last year. For the coming season, data have been already furnished regarding the production of sugar-beet in Belgium, Bulgaria, Hungary, Netherlands, Poland, Switzerland, Canada and the United States; altogether, will be 10 per cent. below 1921. In Germany, despite the rains during August, sugar-beets have made no improvement, and nothing more than an average yield can be expected. In Czechoslovakia the yield is expected to be above the average, and in France the crop condition points towards a good yield, and in some departments even an excellent one.

THE BREEDING AND MANAGEMENT OF GEESE.

A. V. D. Rintoul, N.D.D., Chief Poultry Expert.

Goose breeding might be profitably carried on in some of the old mining districts in the State where land is not specially valuable. The two principal breeds of geese are the Toulouse and the Embden. The standard weights are as follows:—

Toulouse gander, 20 lbs. to 26 lbs.; goose, 16 lbs. to 20 lbs.

Embden gander, 18 lbs. to 20 lbs.; goose, 16 lbs to 18 lbs.

The Toulouse goose originated in Toulouse in Southern France, and is the largest variety known. In colour it is dark grey on the back, shading to light grey and white on the breast, and white on the abdomen. The eye is brown, the beak lightish orange, feet and webbing orange. The body is massive, broad and deep, of medium length, practically touching the ground. The female lays from about 18 to 36 eggs a year, but is not a good sitter.

The Embden goose originated at Bremen, and is pure white in colour, hardly as large as the Toulouse, but rather more upright. The female lays nearly as well as the Toulouse, but is a better sitter, the young goslings grow quickly and mature early. Where hatching by hens is practised, the usual custom is to give four goose eggs to one hen, the hatching period being about 30 days.

Geese subsist largely on grass, which they graze fairly closely, and other stock do not care to follow them on pasture land. They can be housed very economically as they need protection only from the wet.

Breeding.

Sex is not easy to distinglish in geese, but the gander is usually larger, and has a more shrill cry than the goose, which has a more guttural note. He is also usually rather lighter in colour than the females. A male is best mated with not more than four geese.

The smallness of the geese in Victoria is partly due to the custom of breeding from very immature stock, as they are not really mature until the third season, and may be kept on for another three or four seasons afterwards.

Hatching.

The eggs should be removed regularly as laid, and set under hens. If the eggs are not removed, the goose will stop laying sooner than she otherwise would. Eggs set under a hen should be turned regularly, as they are rather large for the hen to turn. About eleven eggs may be set under a goose. Though the use of incubators for goose eggs is uncommon, there is no reason why it should not be used. With

goose eggs, the machines should be run at from about 101.5° to 102.5° Fahr., and kept rather more moist than is usual with hen eggs. The young goslings hatch somewhat slowly under hens, and should be carefully watched for head lice, to prevent which some lard may be smeared on the head.

Feeding Young Goslings.

No feed whatever should be given for the first 36 hours or so, though fresh water may be provided, also plenty of grit. Bread crumbs and milk may be given as a first feed, with finely chopped green stuff. Barley meal, pollard, and maize meal may be given for the next two or three weeks, after which—if plenty of green stuff is available—they will need only about one feed a day.

Fattening for Market.

When topping off for the market the geese should be kept confined in small flocks of twenty or so, and fed on oat pollard, barley meal, and maize meal, with any separated milk that may be available, green feed also being fed once a day.

The birds should be disturbed as little as possible, and will put on an increase in weight of 4 or 5 lbs.

In America a system of hand feeding called "noodling" is practised, about ten geese being kept in a small pen of about 8 feet by 12 feet. The birds are hand crammed by the operator, who sits on a box with the goose between his legs, and stuffs the "noodle" or bolus down the goose's throat. They are fed up to five times a day at four-hour intervals, and the food is worked down by the hand on the outside of the neck. The "noodle" or bolus is about 2½ inches long, made of equal parts of wheat meal, oat pollard, barley meal, and maize meal.

From 50 to 100 geese per day can be fed in this manner by one man, though this will mean that his hours of work will be prolonged. The birds will put on up to 10 lbs. increase in weight, and the value per pound weight is also much increased. During 1921 the price for geese varied in New York from 28½ cents per pound to 15 cents per pound, as against 37 cents down to 23 cents for fowls.

Killing and Plucking.

Geese are usually killed by bleeding from the main artery in the mouth, being at the same time struck a blow on the back of the head. Plucking is not easy, and is often done "wet" instead of dry, by steaming the feathers prior to plucking.

Individual weights of up to 40 lbs. have been obtained by the hand cramming process.

In America goose feathers fetch high prices, even up to one dollar a pound for the pure white feathers.

CASSE.

WINE DEFECTS NOT DIRECTLY CAUSED BY MICRO-ORGANISMS.

By F. de Castella, Government Viticulturist.

(Continued from p. 621.)

Bottle Age.

The second stage of the maturation of wine mainly occurs after the wine has been bottled, though it may also develop, but usually in lesser degree, on lengthy storage in receptacles of larger capacity. It constitutes what is usually known as bottle ageing, and is mainly characterized by the development of bouquet and aroma in the wine. These terms, though almost synonymous, are not entirely so. Some writers, in fact, distinguish between the two, looking upon bouquet as the fragrance discernible by the sense of smell and perceptible by the nose; whilst aroma is detected at the back of the palate when the wine is tasted.

Both bouquet and aroma—if any distinction between them is admitted—are due to the presence in the wine of fragrant substances resulting from the reaction on one another of the various constituents of the wine during prolonged storage in closed vessels of small capacity.

The reactions which occur during this second stage are of far greater complexity and less thoroughly understood than the oxidation phenomena characteristic of cask ageing, which were so ably investigated by Pasteur. They seem to belong to three distinct groups of chemical reactions:—

1. Formation of Esters, or Esterification.
2. Aldehydification.
3. Elimination of higher alcohols.

Concerning the relative importance of each, authorities are by no means in agreement. Further investigation may lead to considerable modifications in some of the views expressed below, which are a *résumé* of our present sometimes contradictory knowledge of the subject.

Esterification.

Esters or, as they were formerly termed, ethers, are compounds between an acid—usually organic—and an alcohol radicle, just as mineral salts are combinations between a mineral acid and a base. When acetic acid acts for a sufficient time on ordinary alcohol or ethyl hydrate, it combines with the radicle ethyl to form ethyle acetate, or, as it is often termed, acetic ether—the substance which gives to pricked wine its characteristic bouquet or odour.

Wine is a complex mixture, in which are to be found, in addition to ordinary or ethyle alcohol, which constitutes from 8 to 20 per cent. of its bulk, minute quantities of higher members of the same series,

such as protyl-, Butyl-, amil- alcohols, &c. It also contains various acids; tartaric, malic and citric are the principal ones present in the grape, but during fermentation others are formed normally, such as succinic and acetic,* whilst basterial action is often responsible for the appearance of additional ones, such as lactic, butyric, propionic, tartronic, and some others. These fermentation acids, as distinguished from those which exist originally in the grape, though only present in extremely minute quantities, seem to play an important part in the development of the bouquet of a wine. The reactions which take place between these and the different alcohols result in the formation of esters, most of which are so extraordinarily fragrant that mere traces are capable of communicating to a wine a distinct aroma or bouquet. The number of different esters, the presence of which is possible in a wine, and the very minute—in fact, almost imponderable—quantities in which they usually occur, render the problem very complex and difficult of investigation. It is, however, very generally admitted that the bouquet of an old bottled wine is largely due to the presence of esters, and that these are mainly formed during its sojourn in bottle. Pacottet points out how, in bottle, "The chemical etherification phenomena of the fixed and volatile acids under the slow action of alcohol take place, and the ethers (esters) thus formed increase the flavour and bouquet of the wine. These ethers increase during the whole of the ageing of the wine. The greater the alcohol-acid content the more pronounced are they."

Esterification is a slow process, and one which seldom reaches an advanced stage; in this it presents a marked difference to the ordinary reactions of inorganic chemistry, which are more rapid and complete. If, for example, to a mixture of 10 parts of alcohol with 90 parts of water a quantity of acid, sufficient to combine completely with the alcohol, be added, this acid will not disappear entirely, but only a small proportion of it, which is known as the esterification coefficient. According to Fallot (R. Vit. 21, XII., 1905):—

Berthelot succeeded in determining almost mathematically the proportions of ethers which will develop in a young wine. This proportion depends on the nature of the medium, its content in acids, alcohol, and water. If water be added to an ether, this is partially decomposed, up to the point when equilibrium is established. He made up mixtures of alcohols, ethers, and acids of similar composition to wine, which were exposed to the action of time at different temperatures. After a lapse of several years, analysis permitted the determination of the proportion of acid and alcohol which disappeared and the quantity of ether which had formed. As a result, the following laws governing etherification were formulated:—

1. Formation of ethers always takes place.
2. Equilibrium of etherification depends on time.
3. The proportion of ethers formed tends towards a limit which is only attained after several years.
4. Temperature has no influence on the quantity of ethers formed, though it accelerates etherification.
5. The etherification limit depends on the proportions of water, alcohol, and acids which interact.

* Though the presence of acetic acid is usually looked upon as a defect which renders the wine unsound, this is only so when it is present in appreciable quantity. Even the soundest and best wines contain traces of this acid.

A practical result of these data is that addition of water or of a wine lower in alcohol or acid content may, by upsetting equilibrium, destroy a part of the ethers which have developed. The wine thus loses part of its bouquet. Addition of alcohol or acids tends, on the contrary, to increase etherification.

The proportion of ethers which develop in a wine varies between 2 milligrammes and 1 gramme per litre. The richer the wine in alcohol and acids the higher will it be.

Berthelot has drawn up tables which render it possible to forecast the proportion of alcohol or of acids which will etherify. Thus, with a wine of the following composition:—

Alcohol	10 per cent.
Acid (as sulphuric)	.4 per cent.
Dry extract	2.5 per cent.
Water	67 per cent.

the table show that .5 gramme of alcohol per litre should become etherified. The process is, however, very slow. At the end of two years, there will be fifteen-sixteenths only of the total quantity of ether which should form.

Bacterial Action.

It would appear that bacterial action may play a much more important part in the normal maturation of sound wines than has been realized until quite lately.

We have become so accustomed to look upon the presence of bacteria in a wine as *primâ facie* evidence of its deterioration that the assignment of any beneficial action to this class of organism will come as a surprise to most cellar managers. This older view is no doubt correct in the majority of cases; whenever bacteria are plentiful it is safe to consider the wine as doomed if not already unsound. As Bouffard wrote in 1911, "The fear of microbes is the beginning of wisdom," from the cellarman's stand-point.

And yet, in small numbers these organisms—or at least some of them—seem capable of playing a not unimportant part in the development of bouquet. Nor should this surprise in view of the fact that most young wines, after the first racking, show under the microscope, at least slight bacterial contamination, few indeed are altogether free from it. Morphologically, a distinction must be made between two groups of organisms. Long, slender, wavy rods (tourne group) are as a rule symptoms of more or less severe trouble; their presence is always a sign of danger. Diplococci (figure 8 shape) are much less grave. and it is to this group that bouquet producing bacteria probably belong.

Laborde's remarkable investigation on the changes taking place in wine during maturation throw much light on this phase of the question. In his introduction to a series of articles* he points out how the slow modifications characteristic of ageing

"have for their cause chemical and physiological phenomena of great complexity. The chemical side is certainly the most important; it consists of two principal actions—oxidation and etherification.

As regards the development of living micro-organisms in the wine, it may influence the above phenomena to some extent, without ageing being otherwise than normal. If, however, the wine should undergo too severe modification in its constitution, it becomes affected by the diseases known as Pousse or Tourne, of bitterness or ropiness, diseases which altogether interfere with the bottle-ageing of a wine."

* *Revue de Viticulture*, 11th April, 1918, Vol. XLVIII., p. 225.

He points out how—

Under ordinary storage conditions anaerolic micro-organisms are rarely absent. Most often, in spite of the wine being perfectly constituted their moderate development slightly increases the volatile acidity without hindering improvement in quality. When this acidity has reached a certain proportion, thus reinforcing the specific resistance of the medium action stops completely.*

Experiments are described in which different samples of a wine of 1905 vintage were purposely inoculated with two distinct bacteria. One of these cultures designed "A" was isolated from a slightly bitter *bourgogne,* whilst the second, known as "B," was from a white wine from Charente inferieure affected with ropiness.

After eight years the wines were tasted and analyzed.

In comparison with sterilized control samples of the same wine, the total acidity of which had reduced, that of both inoculated wines had increased. These also showed an increase of volatile acid, both free and etherified, about equal in each case.

If the ratio E/T had not materially changed it is because bacterial action was only slight. Nevertheless, the increase in ethers is rather noticeable, proving that both organisms were, from this standpoint, desirable ones.

If, to the taste, there is not much difference between the development of the two organisms, there is a marked difference in the "nose", a more pronounced bouquet being detected in wine "B" than in "A." The former had also a quite distinct odour, more accentuated, and reminding of truffles. To the taste, "B" also showed more refinement.

There thus exist, among the disease ferments of wine, improving and deteriorating races, just as there are good and bad alcoholic yeasts. It can therefore be seen that the suppression, by pasteurization, of all bacterial development during the ageing of wine may sometimes lead to results inferior to those furnished by the same wine if not pasteurized. Of course, for it to be thus, bacterial action must not exceed a certain limit, variable, however, according to the nature of the wine.

Aldehydification.

Ethyl-aldehyde has long been looked upon as a normal constituent of wine, though in very variable quantity. It abounds in sherry, and is probably plentiful also in Madeira and Port, in fact, in all wine having a *rancio* character. It is particularly abundant in wine on the surface of which *mycoderma vini* (flowers of wine) has developed.† Recognition of the important part it plays in maturation is mainly due to Trillat's investigation, the results of which were published in 1908.‡ Trillat had previously shown (in 1893) that if formol or formaldehyde is added to a wine, it combines with the colouring matter, precipitating it in an insoluble form to such an extent that complete decolouration is thus possible. Ethyl-aldehyde acts similarly, though in a less pronounced manner, causing a cloud, followed by the formation of a sediment, altogether similar to that normally thrown by many wines. Trillat's communication of 1908 describes further investigations on the same subject. It was reviewed by L. Roos in *Progrès Agricole,* of 24th January, 1909, wherein he points out how—

"Mere exposure to air, of a weak aqueous solution of alcohol, provokes the formation of aldehyde by oxidation of traces of its alcohol. . . . In the case of wine, the quantity of aldehyde produced is very much greater."

* *R. Vit.*, 1st August, 1918.
† X. Rocques, in *Revue de Viticulture*, 22nd March, 1902; also *ibid.* 26th February, 1903.
‡ M. A. Trillat, in *Annales de L'institut Pasteur*, November, 1908.

. . . . the nature of the sides of the container, and the composition of the medium, exert their influence. The presence . . . . of micro-organisms, such as yeast and bacteria in suspension in the liquid, accelerate its formation. In like manner, certain substances in solution, such as enzymes, or even certain mineral substances—manganese, iron, &c., which act somewhat like enzymes—play a similar part.

The absolute quantity of aldehydes produced is always very small, at most one five-thousandth of the total volume, but this quantity is nevertheless considerable so far as the important effects it may cause. . . .

Aldehyde, if too plentiful, may play an undesirable part . . . . by increasing the action of oxydase in different cases of Casse. By polymerization it produces substances with a very persistent bitter taste. According to M. Trillat, the characteristic flavour of wines affected by the disease known as bitterness is due to these aldehyde-resins.

In lesser quantity, such as may be termed normal, the part played by aldehyde is not less interesting. It is slowly transformed into acetal and acetic acid, substances which contribute to the formation of bouquet of wine or of the brandy distilled from it.*

It is likewise aldehyde, either as such or in the form of acetal, which is derived from it, that causes changes in the colour of red wines.

Trillat's ideas concerning the important part played by aldehydes in the maturation of wine, attracted very much attention in wine-making circles. Roos, in the review already referred to, highly eulogizes his work. He, nevertheless, points out that "If he (Trillat) has not proved that ethyl-aldehyde plays a preponderating part in these (maturation) phenomena, he has at least shown that it participates to a sufficient extent for its influence to merit further study and investigation, a view which is shared by most standard writers on oenology. An excellent review of Trillat's investigations and results was contributed to *La Revue de Viticulture* of 27th May, 1909.

Elimination of Higher Alcohols.

That this is one of the changes which accompany maturation of wine is evident from investigations conducted by Kayser and Demolon†, which led them to the conclusion that wines stored under aseptic conditions and exposed to moderate aeration, yielded, on distillation, spirit showing a marked reduction in the content of higher alcohols. Aldehydes and esters, on the contrary, were rather increased. They point out how—

> "It has previously been noted that the ageing of spirits may be compared to a true rectification. It is now recognised that aldehydes play an important part in this direction, thanks to the

* See also X. Rocques, *Revue Vit.*, 26th February, 1903. Aldehydes combine with alcohol to form acetals, which are to be found in wines and brandies. They are highly aromatic substances, some of them being distinguishable if present at the rate of 1 in 10,000. It is probable that acetals play a part in the bouquet of wine.

† E. Kayser and A. Demolon, in *Revue de Viticulture* of 18th July, 1912, Vol. xxxviii., p. 65. Influence of several factors, and particularly calcium salts, on the ageing of wine in the presence of yeast. The investigations described were mainly undertaken with a view of elucidating the influence of limestone soils on the quality of brandy distilled from vines grown on such.

formation of acetates capable of resinification. We have noted the same fact in the aseptic ageing of wine, which is characterized by a marked diminution in the higher alcohols content. As regards aldehydification and esterification, these also take place."

This is a phase of the question which does not apear to have received the attention it merits.

Laborde's Investigations.

Probably, the most exhaustive and authoritative research work undertaken of recent years in connexion with the ageing of wine was conducted by Laborde, who published the results in a series of articles which appeared in *La Revue de Viticulture* in 1918. The final articles were only printed after his untimely death, in July of that year.

The following extracts from his general summary will give an idea of the present state of our knowledge on this complex question. On comparison with previous quotations, it will be seen that, on some points at least, there still exist considerable differences of opinion:—

Laborde recognises, in the first place, that the part played by oxidation in the normal ageing of wine remains, on the whole, the same as has been known since the work of Berthelot and Pasteur, consisting in modifications in the taste, in the bouquet, and in the colour of the wine.

During the sojourn in bottle, oxidation may be very much reduced without the transformation of the wine being seriously checked, since quite pronounced ageing can take place in full bottles, the necks of which have been sealed in the blow-pipe flame. Under such conditions, it is brought about solely by the quantity of oxygen absorbed during and previous to bottling.

The coagulation of tannoids progresses more or less rapidly, but solely under the influence of direct oxidation; only a trifling part can be attributed to aldehydification of alcohol under normal conditions, with corks of good quality. wines which remain sound, and before ageing has yet reached an extreme degree.

Slight bacterial action may hinder oxidation for a long time, and considerably retard the conditioning (depouillement) of the wine.

In wines which are more affected (by disease), aldehydification is usually more marked because the bottle leaks, and the resulting ullage favours oxidation, and consequently the more rapid precipitation (depouillement) of the wine. The change in the composition of diseased wines (tourne or bitterness) has likewise an influence on the coagulation of tannoids, which is supplementary to the last-named.

In the case of "Bitter disease," the very bitter taste met with, more particularly in very old wines, seems connected with the presence of various aldehydic substances, such as acetic and acrylic aldehydes; these, after polymerization and oxidation, are, according to Trillat and Voisenet, responsible for the bitter taste.

Etherification, which would seem, according to Berthelot's formulæ, to be of considerable importance, is, on the contrary, a very limited reaction, the fixed or volatile ether contained in wines which have aged normally being almost exclusively derived from the fermentation of the must. These formulæ do not, thus, apply to wine, which is too complex a substance, and which, even if completely protected from contact with air, is the seat of many other slow reactions, very difficult to specify. I have, nevertheless, observed, especially in certain sterilized wines, a real, though very slight increase in total volatile acidity, which is simultaneous with a decrease, usually much more appreciable, of fixed acidity.

Taking the ratio of etherified volatile acidity to total volatile acidity—in other words, the ratio E/T, it will be noted that its value averages 0.30 for wines of Gironde (clarets), being remarkably constant in the case of normal ageing, even over very lengthy periods exceeding 30 years. This result thus confirms conclusions relating to the small importance of etherification during

ageing. Further study of the ratio E/T might perhaps enlighten us concerning the influence of the cultural conditions under which the grapes were grown, and of the wine-making method, on the quality of the wine, and permit the fixing of a fairly precise distinctive character for the wines of the different regions which prove capable of prolonged improvement in bottle.

Thread-like ferments (bacteria) in wine can augment, to a greater or lesser degree, the initial quantity of etherified volatile acid at the same time as that of the free volatile acid. These seem really to be producers of ethers, as are also alcoholic yeasts; but the ratio E/T is, as a rule, smaller with bacteria than with yeasts, with the result that this ratio falls progressively as the injury caused to the wine becomes increasingly noticeable.

This influence of bacteria, provided it remains below a certain limit, is sometimes favorable to quality of a wine by reducing the fixed acidity and improving the bouquet. Unfortunately, the special races of bacteria possessing these properties are little known, and probably rare. Were they better studied, they might, perhaps, be worth propagating for wine-making purposes, as is done in the case of selected yeasts.

Notwithstanding what is known concerning the variations in the quantity and quality of volatile ethers during the ageing of wine, the development of bouquet still remains, at least in part, a mystery. As was thought by Berthelot, and especially by Pasteur, it also depends on the slow oxidation, which modifies the aromas, originating solely in the grape, the subtleness of which becomes very great. If bouquet increases from the time the wine is bottled, it is because all evaporation is prevented of the different odoriferous substances which are subsequently formed.

As regards the influence of aldehydification, or, perhaps more correctly, of acetalization, it only seems capable of influencing the bouquet when the oxidation of the wine is very much advanced, and consequently when it begins to be "worn" by losing more and more of the qualities which it had acquired during normal ageing. This conclusion does not, however, apply to liqueur wines, which owe to energetic oxidation a great part of their special characters.

OLD JOURNALS OF AGRICULTURE REQUIRED.

The issues of this *Journal* for the months of September, 1920, and January, February, and August, 1921, are out of print.

As requests for these issues are being received, principally from libraries desirous of completing their sets, we would be grateful if any of our readers possessing copies for which they have no further use, would post them to the Department of Agriculture. Postage will be paid by the Department.

AGRICULTURE ON THE HIGHLANDS OF CENTRAL VICTORIA.*

A study of the rainfall map of Victoria shows that there is a small block of country, mostly in the central north district, roughly some 36 miles by 12 in extent, running east-north-east from Newlyn as far as Mt. Macedon and south from Newlyn to Bungaree, and from Kyneton to the top of the Dividing Range. This country is over 1,800 feet above sea level, culminating at 2,500 feet near Bullarto, and at 3,324 feet on Mt. Macedon, and it enjoys an average yearly rainfall of from 30 to 40 inches. The climate is very healthy and bracing, bleak in winter, with night frosts hard enough to make the ground like iron, though the mid-day sun soon thaws them, and snow, which often falls, but rarely remains over 24 hours on the ground. The winter winds from the south are very bitter and tell severely on live stock where the shelter of timber has been removed. The bulk of the rain falls in winter, and comes in from the north, and when the wind veers south-west the weather as a rule takes up; but occasionally some of the heaviest rains have come in from the south-east. In summer the weather is comparatively dry, but it cannot be said that a real drought is ever experienced; in fact, the climate approaches nearly to British conditions, except that in the United Kingdom the rainfall is more diffused throughout the year, and the winter is colder.

The bulk of this hilly country overlies the slaty, sand, and ironstone and quartzite rocks, interspersed with volcanic eruptions of basalt or bluestone. The soils are largely clay and sandy loams, and along the water-courses are wet deposits of black soil. Where the volcanic rocks are decomposing there are areas of red and chocolate soil, which are rich in available plant food. Owing to the tilt of the lower strata of rocks the natural drainage is good. The soil is generally well supplied with potash, but the natural phosphoric acid content is low, like the rest of Victoria, the average being less than 50 parts of phosphoric acid to 100,000 parts of soil, which will not bear comparison with similar British soils, where phosphoric acid averages 98 parts per 100,000. The land naturally contains but little lime, and what there is will be found mostly in the volcanic soils, where the steam cells of the honeycombed basalt contain lime in the form of zeolites, which probably accounts for the extra fertility of these soils. However, the quantity of lime there present is small, and heavy cropping and over-stocking soon reduce it, and acidity of the soils is general. The heavy winter rains also leach out the lime, and the same applies to the nitrogen, for which the land cries out if any growth of vegetation is expected.

At one time the district was heavily timbered with eucalypts, such as Peppermint, Messmate, Swamp and White Gums, which alone can withstand heavy frosts. Black or lightwoods and Silver Wattles are common, and exotic trees like Pines, Cypresses, Poplars, Willows, and Oaks do well, and it is one of the few parts of Australia where the Beech will thrive. Fruit trees do well, especially the small red fruits,

* This article has been contributed by a farmer in the district described. The suggestions made are practical, and will no doubt be of interest to agriculturists in the district and in others where somewhat similar conditions obtain.

like currants and gooseberries, but the climate is too severe for citrus culture. Maize will not ripen, but other cereals, especially oats and rye, do well, though rust is troublesome in some seasons. Up to 30 years ago the White oat was universally grown, but the Algerian oat has since displaced all other varieties, and as time has gone on the tendency has been to sow cereals much earlier than formerly, and experience shows that Algerian oats sown in March do best in the long run. Peas were much grown, alternating with potatoes, but the quantity now harvested is small. Potatoes are one of the main cash crops, and yields of 10 tons to the acre were often obtained in the early days, but in time the yield decreased to an average of 3 tons and less per acre. Of the varieties grown, Carman I. is the first favorite, and the Snowflake for the later crops. Turnips used to be grown in the paddock, and one hears of phenomenal crops having been seen, but now few are grown outside the kitchen gardens. Rape as a summer crop is common, and when rain falls in summer it does well, but if sown in autumn the heavy rain makes it impossible to feed off, and when spring comes the plant at once rushes up into flower. Lucerne has been tried on a few farms, but is not a general success; it does best on high land, but as more than two cuttings cannot be relied on in one season, it is doubtful if it pays as well as Cowgrass clover, which grows well everywhere, and often yields two cuttings in the year.

The district was early settled in small properties during the fifties of the last century, and what speaks well for the country is the fact that many of the farms are in possession of the grandchildren of the original settlers. Latterly, since the advent of the rabbit and the gradual decrease in fertility of the soil, the tendency has been towards the aggregation of the small farms into larger grazing areas, and consequently the population is diminishing. At Tylden, for example, the school attendance averaged 80 children formerly, whereas now it is hardly 30. The lure of the cities and the returns from cheaper land in the north and north-west of the State have led many of the younger men to leave the district. At one time gorse hedges and log and chock fences were a general feature of the landscape, and a pack of fox hounds was maintained at Kyneton some thirty years ago, but the rabbit led to the substitution of wire fences, and the use of barbed wire stopped the hunting and checked the breeding of hunters for which Kyneton was famous.

The rabbit is not the only cause of the decrease of soil fertility, but the practice of selling the cereal hay crops off the farms has played its part, and the land is now having a period of rest by the conversion of much of the arable land into grazing areas, but the grazing quality of the land is not of a high order, owing to the fact that there is practically no growth in the grass from May till the end of September, and it is further evidenced by the now general absence of clovers. Old residents will tell how the grass paddocks used to be white with clover in the spring, and how the presence of Perennial Rye grass was universal, but latterly Creeping, Bent, Fog, and Twitch grasses have invaded the land, and it is known that these prefer to grow in acid soils. However, where lime and phosphoric acid are applied to the pastures the clovers at once return, and when these put nitrogen into the soil the Rye grass resumes its sway. Cape weed does not thrive, but the Californian

thistle has invaded many a farm, and the Asphodel or Onion weed has reached the roads near Woodend.

Rotation of crops in the past did not receive much attention. Potatoes were often grown twice in succession on the same ground, and two and three oat crops running were quite common, but slowly the need of a system of rotation has begun to be realized. Too often the stubbles of a cereal crop were allowed to come back to grass by the unaided efforts of nature, which meant that Bent and Fog grass, Dandelions, Sorrel, and other weeds occupied the land to the exclusion of the better grasses and clovers. The denudation of the soil lime led to peas ceasing to be popular, and the use of commercial phosphatic fertilizers has only been general in recent years, but even now on many farms cereals are still sown on volcanic soil without any manure at all. The wonderful effects of 56 lbs. of superphosphate per acre in the Wimmera and Mallee were expected to yield similar results here, but latterly heavier dressings of phosphate are found to be necessary. However, the general presence of iron in the soil leads to the reversion of much of the free phosphoric acid in this manure into phosphate of iron, which refractory compound is so insoluble that much of the phosphoric acid is lost to the farmer. Where lime is present in the soil, the phosphoric acid at once attacks it, forming the dibasic phosphate of lime, which, so slowly soluble, is available for plant growth. When ground limestone could be bought for 10s. a ton f.o.r. at Curdies River, it paid to use it, many giving half a ton per acre as a dressing with success, but the present price, including bags, being 38s. 6d. per ton, plus the railway freight to Kyneton 8s. per ton, its cost is prohibitive. In New Zealand the railways carry lime at a merely nominal rate, and if this example were followed by the Victorian railways, the result would be a greater amount of produce leaving the district. Before the war, basic slag was used by many with good results, and the basic phosphate now on the market leads to soil improvement, and is useful in this district with such a heavy rainfall, and some farmers are now using this fertilizer with all their crops. One ton of basic phosphate is made by mixing 18 cwt. 1 qr. 7 lbs. of superphosphate with 3 cwt. 3 qrs. 21 lbs. of lime, and contains 14 per cent. of dibasic phosphate of lime and 3 per cent. dibasic phosphate. In addition, there is present some 38 per cent. of sulphate of lime, which in the soil becomes converted into carbonate of lime, setting free the potash in the ground. Potash is essential to the formation of the yolk in sheep's wool, and the sulphur is a constituent of wool and plant growth. The phosphate of lime enters into the herbage, making it more palatable, and thus goes to build up the bony framework of all farm animals.

While attention has been directed rather to the development of the wheat areas, this district has been left in the cold, and its agriculture may be described as somewhat quiescent. The mistakes made in the past management of the soil are those usually seen in newly settled countries where rough and ready methods are inevitable, but now these errors are being realized, and the attention of many is being directed to soil improvement. A useful study is obtained by comparing the rotation practised on similar soils in Wales, the south of Scotland, and in the New England States of the United States of America, where, as the result of long experience, an eight-course rotation has been arrived at, usually on these lines. First, a cereal crop, followed by a root crop,

and then a second cereal, and, lastly, the land is seeded to grass and used as a pasture for five years. During the pasture period the land is storing up humus to be used during the cropping period of the rotation, and the grass is well manured with farm-yard manure obtained from feeding roots and meadow hay to the live stock. It seems that, with some modification, a rotation on these lines is needed in this district, and it is already being carried out by a few farmers thus: After the grass land is broken up at the end of winter, it is fallowed and worked up to kill Twitch and weeds and made ready for an Algerian oat crop sown in March. Should the land be clean, a crop of summer rape is often put in after the first ploughing, and on being fed off by sheep this is ploughed in and the first cereal crop sown in autumn. After this first cereal crop, a crop of rape is taken in the following summer, and then the second cereal crop is sown. When this latter is harvested and sheep have foraged the stubbles, the land is disked and rolled and sown down with mixed grasses and clovers and rolled again. On low ground Perennial Rye grass does best, whereas Cocksfoot prefers the high ground. To make a good bottom sole of turf 1 lb. of tested Dogstail per acre along with Cowgrass, Alsike, and White clovers does best. Of the other grasses, various Fescues have been tried, and though they grow, they are not in much favour, and hitherto attempts to make a permanent stand of Timothy have consistently failed. Why this valuable grass should not succeed here is hard to explain, but the grass comes up the first season and then gradually dies out. Perhaps this is due to insufficient nitrogen. Creeping, Bent and Fog grasses sooner or later enter the pastures of themselves, but top-dressing with plenty of sulphate of lime keeps them in check. Kentucky Blue grass will grow, but its roots form a twitch, and Prairie grass does so well that it is soon eaten out and gets little chance of seeding. The cereal, rape, and grass crops need to be sown with plenty of phosphate, and it will be found that in all the crops there will be a spontaneous growth of cluster clover and yellow trefoil, which adds to the feeding value of the crops and puts nitrogen into the soil. After five years in grass the land is again broken up and the rotation repeated.

There is, however, one weak point in the above method, for after the first cereal crop the land lies in stubble during the following winter before sowing the rape, when what nitrogen that may be present is being leached out by the rain. This can be remedied by disking and rolling the stubble in February and drilling early in March a mixture of 1 bushel (20 lbs.), of Italian Rye grass and 10 lbs. of Red clover (not Cowgrass) or Crimson clover (*Trifolium incarnatum*). The clover can be mixed with basic phosphate and sown through the manure runs of the drill, while the grass seed can go through the wheat runs, setting the drill as if to sow 40 lbs. of wheat. The tubes are taken out of the boots of the drill hoes or coulters and allowed to swing loosely, and a chain harrow is hitched behind the drill to cover the seed, which is rolled again and left. This grass and these clovers are annuals, and vigorous growers, and make splendid meadow hay which is an almost perfectly balanced ration for milking cows, though Crimson clover is not suitable for horses. Italian Rye grass seed to-day costs 9s. 6d. per bushel, and Red and Crimson clover each 1s. 3d. per lb.; therefore the cost per acre for putting in should work out thus:—Seed, 22s.; basic

phosphate (one bag), 186 lbs., 10s.; disking, 2s. 10d.; rolling twice, 2s. 6d.; drilling, 2s. 4d.; total, £1 19s. 8d. Mowing will cost per acre, 1s. 10d.; raking, 1s. 4d.; carting and stacking, say, 3s., making a grand total for putting in and taking off of £2 5s. 10d. Assuming the yield to be only 30 cwt. per acre, then this brings the cost of this fodder at £1 10s. 7d. per ton, which is cheaper than oaten chaff. Then there is the value of the farm-yard manure to be deducted after eating this hay, and the unearned increment in the way of nitrogen put into the land by means of the clover, and the feeding value of the aftermath before the land is broken up for the second cereal crop. This grass is only intended for a one year's lea, and it is for the purpose of keeping the land occupied in winter to save nitrogen, the nitrogen formed by the clover being packed round its roots where rain cannot harm it.

The following is a good rotation on potato land: After the lea is broken up at the end of winter and worked up deeply and fine by November, all the available farm-yard manure is spread just before planting the potatoes. It is a common practice here to drop a little phosphate on each seed potato by hand in the furrow before covering with the plough, and the amount thus applied works out at one and a half bags, or 279 lbs., per acre. However, it is easier to drill the phosphate on the land before planting, and so diffuse the manure more through the soil. When the potatoes are dug, say, in May, after raking away the haulms and ploughing, at once drill in White oats or barley with phosphate. When that is harvested, sow in March Italian Rye grass and Crimson clover as above described; when this is mown and stacked and the aftermath eaten out by sheep, the land will be ready for a crop of Algerian oats. When the oat crop is harvested, the paddock can be sown with 1 bushel of Perennial Rye grass and 8 lbs. of Cowgrass clover, which will remain in the ground for four years. To make the clover last well, it needs a top-dressing yearly with one bag of basic phosphate per acre, and this will give splendid hay for winter feed. After mowing, there is a good aftermath, and in some seasons a second cutting will be obtained, in which case, however, there will be little after-growth. At the end of the four years the land will be ready for potatoes again. During the grass and clover period the humus will increase in depth. In one paddock treated this way where the humus to start with was only 3 inches deep, at the end of four years when the plough was set to cut a furrow 8 inches deep for the potato crop, no subsoil was turned up. In following this plan of rotation on potato land, practically nine bags, or 1,674 lbs., of basic phosphate will be applied per acre, or less than ½ lb. per square yard, which is not much when spread over a period of eight years, but it makes all the difference to the fertility of the soil and the quality and quantity of crops grown. Making a change in the variety of clover grown, by using Crimson clover at one time and Cowgrass at another, obviates the risk of clover sickness appearing, but this disease so far has not been seen here. Should it appear in the Cowgrass, then Alsike clover might be substituted alternately with the latter in the final four years of the rotation.

This country is capable of great production, its grazing is sound, for fluke is rare and foot rot practically unknown, and the bracing climate is the best for developing vigour in all animal life, that of man included, but farming here must advance rather on lines followed in the

South Island of New Zealand, where provision has to be made for providing food for the farm live stock during each winter, and not so much for the droughts which hang like the sword of Damocles over the heads of farmers in the North. Many of the farms are under-capitalized, but when that capital is concentrated on smaller areas the land will be made to yield more, and its fertility must increase.

GOVERNMENT CERTIFICATION OF STANDARD COWS.

Conducted under the Direction of the Honorable the Minister for Agriculture for the Encouragement of the Dairying Industry of Victoria by the Up-building of Profitable Herds.

Regulations.

Entry.

1. (*a*) The owner of any herd of pure bred dairy cattle may apply for entry of his herd in the test.

(*b*) Only those cows will be accepted for test which are registered, or have been accepted for registration, in a recognised herd book or pure stock register.

(*c*) All cows in the herd must be tested, with such exemptions only as are set out in clause 8.

(*d*) Any cow entered for test and any calf the progeny of such cow must be branded in such manner as to insure identification, if the Chief Veterinary Inspector of the Department of Agriculture so directs.

Fees.

2. Each herd owner shall pay to the Department of Agriculture, on entry of his herd, and annually thereafter, a herd entry fee of £2, together with a fee of 10s., repayable at each lactation period, for each cow submitted to test. Provided that, in respect of a herd owned solely by a returned soldier, and being his *bonâ fide* property, during the first five years the herd is under test, and no longer, the fees chargeable shall be one-half of the amounts above specified—that is, a herd entry fee of £1 payable on entry and annually thereafter, and a fee of 5s. per cow, payable on entry and repayable at each lactation period.

Lactation Period.

3. Testing and recording shall occupy a period of 273 days, commencing one week from date of calving, excepting under such circumstances as are set forth in clause 8 of these regulations. This period shall be recognised as the official lactation period. In the event of a cow aborting, the lactation period shall thereupon terminate. If the testing of any cow be discontinued by an owner, without a reason deemed to be sufficient, during a lactation period, and before it has qualified for a certificate, such cow shall, in the published report, be included in the number of those which have failed to qualify for a certificate.

RECORDING.

4. The milk from each cow under test shall be weighed separately immediately after each milking by means of tested and approved scales, and the weight shall be recorded at the time on a printed chart supplied for the purpose by the Department of Agriculture, and which shall remain the property of the Department. Such weighing and recording shall be carried out at the milking shed, and the scales and chart shall be available for inspection by a Government Dairy Supervisor when required. During the process of drying off a cow no weight of milk under 4 lbs. per day shall be credited to the same.

SUPERVISION AND TESTING.

5. (*a*) A Government Dairy Supervisor or Herd Tester under the direction of the Chief Veterinary Inspector, will make periodical visits for the purpose of checking records and taking samples of milk for testing. There shall be not less than nine visits during the official lactation period, and these visits shall as far as practicable be at intervals of not more than 30 days. Additional visits may be made by a Supervisor or Tester for the purpose of taking supplementary records and samples for testing at any time, and as often as may be deemed advisable.

(*b*) Every facility shall be afforded Government officers in carrying out their duties under these regulations and accommodation for them must be provided over night when required.

(*c*) Particulars as to date of calving, service, drying-off, hours of milking, and manner of feeding, must be furnished on the request of the Chief Veterinary Inspector or visiting Dairy Supervisor or Herd Tester. If deemed necessary in any case an owner may be called upon to furnish a statutory declaration as to the correctness of such or any particulars.

(*d*) In collecting samples for testing, samples of each milking will be taken separately; the tests will be made by the Chemist for Agriculture or his deputy from such samples, and the results, unless considered abnormal, shall be considered as the average for the period intervening since the next previous normal test. If abnormal the results may be discarded, and further samples taken and tests made.

(*e*) Should an owner's records of daily milk yields not be corroborated by the check weights obtained by a Supervisor or Tester the Chief Veterinary Inspector may, after affording the owner an opportunity for explaining such variation, discard the owner's records and allot an average based upon the officer's check weights immediately preceding the period in question and those at the conclusion of such period.

STANDARD COWS.

6. (1) Standard cows under these regulations shall be those which, during the official lactation period, yield—

(*a*) in the case of cows commencing their first lactation period and being then under three years of age, 175 lbs. of butter fat;

(*b*) in the case of cows commencing their first lactation period and being then over three years of age, 200 lbs. of butter fat;

(*c*) in the case of cows commencing their second lactation period and being then under four years of age, 200 lbs. of butter fat.

(*d*) in the case of cows commencing their third or any subsequent lactation period or being over four years of age, 250 lbs. of butter fat.

(2) A standard cow shall be tattooed with the official crown, and a number allotted by the Chief Veterinary Inspector.

Certification.

(*a*) A Government certificate will be issued on the owner's application in respect of every standard cow, and such certificate shall include the following particulars, viz.:—Breed, age at entry, brands and marks (including the official tattoo), official lactation period, date of completion of test, weight of milk recorded, the amount of butter fat and commercial butter (estimated on a 14 per cent. over-run), and the weight of milk yielded on the last day of the official lactation period.

(*b*) A certificate issued in respect of any standard cow shall, if she attains the standard during any subsequent official lactation period be returned to the Chief Veterinary Inspector for the indorsement thereon of the results of each such successive lactation period.

Exemptions and Disqualifications.

(8) Exemptions from test may be granted by the Chief Veterinary Inspector in respect of cows which come within the following category:—

(*a*) Cows which are ten years of age or over at the time of entry of the herd.

(*b*) Cows eight years old or over the yields of which have been recorded for three official lactation periods.

(*c*) Cows affected by injury or sickness, including abortion, which in the opinion of the Supervisor or Tester, confirmed by the Chief Veterinary Inspector, seriously impairs such cows' capacity for milk production.

(*d*) Any cow which on examination is found to be affected with tuberculosis shall be withdrawn from the test, and such cow's milk shall not be allowed to be used for sale, or for the preparation of any dairy produce for sale.

(*e*) Any cow which, on examination, is found to be affected with actinomycosis of the udder, or any other disease or condition which may temporarily render her milk injurious, may remain in the herd for testing, but her milk shall not be used for sale or for the preparation of any dairy produce for sale without permission of the Chief Veterinary Inspector.

(*f*) When any newly-calved cow is rendered temporarily unfit for testing by being affected with milk fever, mammitis, retention of placenta, or other ailment affecting newly-calved cows, the period elapsing between the calving and

entrance to the official lactation period may be extended on the recommendation of a Veterinary Officer or Supervisor, but such period shall not exceed one month from date of calving.

(*g*) Should the owner of any herd entered not conform to these regulations, such herd shall be subject to disqualification for such period as the Minister may determine. The Minister retains the right to withdraw any certificate when good and sufficient cause is shown.

INTERPRETATIONS.

9. Any interpretation or decision in respect of these regulations, or in respect of any matter concernign the certification, which receives the written approval of the Director of Agriculture, shall be final.

LOSS OF BUTTER-FAT IN THE MAKING OF CHEESE.

By G. C. Sawers, Cheese Expert.

If rich, yellow cheese is to be produced, it is essential that but the smallest percentage of fat possible be lost from the milk. The chief causes of undue loss of fat in the making of cheese are:—(1) The milk being too sweet; (2) the setting temperature being too low; (3) use of insufficient rennet; (4) allowing the curd to get cold; (5) failure to handle the curd gently, with the consequence that much fat escapes in the whey; and (6) faulty pressing.

Unless the milk is sufficiently acidified at a suitable temperature, and coagulated with the correct amount of rennet for the particular kind of cheese desired, the result will be a soft curd, which readily parts with its fat.

It is generally necessary to ripen, *i.e.*, to acidify, the milk by the judicious use of a lactic acid starter, and the milk should always be tested for acidity before any rennet is added.

The curd must be cut very carefully and afterwards stirred gently: it is during this operation that much fat is often lost.

In cold weather precautions must be taken to prevent the curd getting chilled; if this occurs the development of acidity will cease, and the curd assume a soft, sweet state, instead of ripening normally. During cold weather, therefore, it is an advantage to slightly increase the renneting temperature degree of acidity.

Frequently fat is lost during the pressing period from a curd which is too soft. For all kinds of cheese the pressure should be applied very lightly at first, and gradually increased so that the maximum will be reached late at night. The application of pressure too soon will inevitably mean a big loss of fat.

In the case of a curd being rather softer or more tender than should be the case less pressure should be given; if the curd be hard, then a greater pressure will be required.

STALLION REGISTER 1922-23

under the "Horse Breeding Act 1919."

Part II.—Registrations from 12th July, 1922, to 16th August, 1922.*.

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1052	Abbey	A	Light	H. J. Blackie	Ararat
850	Abbey Mac	A	,,	T. Shearwood	Dooen
1053	Abbot's Best	A	Draught	Jas. Egan	Barwite
1121	Abbotsford II.	4	,,	D. H. Adams	Elmore
1054	Aberdeen	A	Thoroughbred	S. W. Podger	Camperdown
1043	Admiral Howard	A	Draught	W. G. Holland	Sheep Hills
1163	Agitator's Heir	A	,,	G. R. Aurisch	Harkaway
666	Aitken Lad	4	,,	Blair and Robson	Melbourne
1164	Alister	A	Light	J. Williamson	Newry
968	Allan Stewart	3	Draught	A. Gillis	Newmarket
851	All Green	A	Thoroughbred	R. Biggar	Waaia
990	All Nations Glory	3	Draught	G. Raynes	Traynor's Lagoon
1055	All Tricks	A	Light	Mrs. J. C. Millard	Condah
1165	Almost	A	,,	D. Lang	Tungamah
775	Amanus	A	Thoroughbred	A. and J. H. Young	Blackheath
820	Anchorite II.	A	Pony	Thos. Clarke	Cohuna
1056	Aristocrat	A	Light	R. Price	Wallacedale South
1122	Ash Voyage	3	,,	Jas. Guthrie	Shepparton
1058	Assembler	A	Pony	N. Ellis	Ballarat East
691	Bando	8	Draught	Sharp and Taylor	South Melbourne
826	Banker Again	3	,,	W. H. Penno	Boort
1059	Barbour 2nd	A	,,	R. G. Holmes	Jil Jil
827	Baritone	4	,,	E. McKoy	Wodonga
852	Barney	A	,,	L. W. J. Hyland	Benalla
1123	Baron	4	,,	W. Maguire	Barwidgee Settlement
1191	,, Athol	3	,,	A. Colvin	Nathalia
692	,, Blaze	3	,,	C. C. Mengler	Linga
853	,, Brae	6	,,	S. H. Wilson	Katamatite
776	,, Bute	A	,,	Rootes Bros.	West Wyalong, N.S.W.
991	,, Clover	2	,,	W. H. Gillett	Lara
828	,, Clydeside	4	,,	W. H. Penno	Boort
1190	,, Crawford	4	,,	L. J. King	Quambatook
667	,, Douglas	5	,,	John Petrie	St. Arnaud North
1192	,, Duke	3	,,	A. Colvin	Nathalia
668	,, Edendale	3	,,	H. Watkins	Euroa
992	,, Fashion	3	,,	T. J. Opie	Deer Park
732	,, Jock	4	,,	Mal. Lynch	Hopetoun
669	,, McDonald	3	,,	Blair and Robson	Melbourne
777	,, McLean	A	,,	D. W. Stewart	Logan
730	,, May	5	,,	H. W. Oberin	Goornong
854	,, Minto	A	,,	Wm. Hermiston	Mansfield

* For registrations prior to 12th July, 1922, see *Journal* for October.

STALLION REGISTER, PART II., 1922–23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
993	Baron Rosebery ..	5	Draught ..	Wm. Allen ..	Junortown
733	,, Silk ..	4	,, ..	J. H. Meyer ..	Kaniva
693	Baron's Premier ..	3	,, ..	Blair and Robson	Melbourne
829	,, Prince ..	3	,, ..	F. Bidgood ..	Staghorn
694	,, Stanley ..	4	,, ..	W. A. Wright ..	St. Arnaud
778	,, Superior ..	A	,, ..	W. Bransgrove ..	Neerim North
1101	Basil B.	A	Light ..	W. A. Riedell ..	Tongala
855	Bell Boy	A	,, ..	A. G. Turnbull ..	Horsham
994	,, ,, Voyage ..	5	,, ..	K. N. McKay ..	Mitiamo
1166	Belmain	A	Draught ..	D. Lang ..	Tungamah
1124	Belmont Again ..	5	,, ..	W. A. Creighton ..	Alexandra
734	Ben Model ..	4	,, ..	H. Adams ..	Yaapeet
779	Berra Bach ..	A	Pony ..	J. Bryce ..	Mitchell's Hill
857	Bickie	A	Light ..	A. G. Turnbull ..	Horsham
1125	Bill Orange ..	2	Thoroughbred	W. J. Everett ..	Tongala
1193	Billy Mac	A	Light ..	W. Calaby ..	Ararat
1126	Black Shepherd ..	4	Draught ..	G. Simpson ..	Tongala
995	,, Voyage ..	3	Light ..	J. Penno ..	Marong
830	Blue Trout ..	A	Thoroughbred	Walker and Quinn	Swan Hill
695	,, Wren ..	A	Light ..	C. Lang ..	Carisbrook
1167	Bob Ash	A	,, ..	Thos. Moore ..	Kialla East
736	Bobbie	4	Pony ..	I. E. Barratt ..	Traynor's Lagoon
858	Bogandyera ..	A	Thoroughbred	J. Hargreaves ..	Dederang
671	Bold Arthur ..	3	Draught ..	Jas. Galloway ..	Majorca
849	,, Donald ..	3	,, ..	J. J. Vite ..	Moorwatha, N.S.W.
696	,, Dundonald ..	3	,, ..	A. McKinnon ..	Walpeup
672	,, Elderslie ..	3	,, ..	Blair and Robson	Melbourne
978	,, Fenwick ..	3	,, ..	W. J. Pethick ..	Adelaide, S.A.
831	,, McGregor ..	3	,, ..	W. H. Penno ..	Boort
1168	,, Newton ..	A	,, ..	J. R. Mitchell ..	Sandford
737	,, Orbost ..	3	,, ..	F. G. Allen and Sons	Broughton
996	Bonnie	5	Pony ..	W. Chynoweth ..	Swan Hill
832	,, Abbot ..	3	Draught ..	H. P. McDougall	Bundalong
1127	,, Baron ..	3	,, ..	T. F. Pickens ..	Kotta
1060	,, Belmont ..	A	,, ..	W. Williams ..	Corrins L. B.
673	,, Knight ..	3	,, ..	Gerrard Bros. ..	Mangalore West
674	,, Ronald ..	3	,, ..	Blair and Robson	Melbourne
1057	,, Scotchman ..	A	,, ..	R. Price ..	S.S. Wallacedale South
1194	Brassey's Pride ..	A	Pony ..	A. E. Millar ..	Hopevale
860	Breedon Pioneer ..	A	Draught ..	M. C. Ryan	Chetwynd
871	Breeze	A	Light ..	T. Ryan ..	Tatura
780	Brigham Again ..	A	Pony ..	J. Burns ..	Euroa
877	Bright Lad ..	3	,, ..	F. A. J. Pahl ..	Murrayville
697	Bristol	4	Draught ..	John Jones ..	Bet Bet
984	British Admiral ..	A	,, ..	W. Sheehan ..	South Muckleford
1044	Briton	A	,, ..	P. Peterson ..	Cravensville
1169	,, Again ..	A	,, ..	T. Fitzgerald ..	Rutherglen
1036	Briton's Pride ..	A	,, ..	A. Cameron ..	Karnak
[illegible]	Brooklyn Junior ..	A	Light ..	M. Lynch, junr.	Dunbulbalane
1195	Brown Lad ..	A	Draught ..	T. Foley ..	Birchip
833	Call Boy	A	Thoroughbred	G. A. Osborne ..	Wodonga West
784	Calland Dale ..	A	Draught ..	J. E. Hooper ..	Devenish

STALLION REGISTER, PART II., 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
835	Canny	5	Thoroughbred	T. A. Griffiths ..	Glenrowan
824	Captain Douglas ..	3	Draught ..	C. S. Rodda ..	Warracknabeal
785	" Llewellyn ..	A	Light ..	H. Bullock ..	Hamilton
786	Carolyn	A	Draught ..	J. R. Peachey ..	Darlingford
1062	Carovita	A	Pony ..	J. Clark ..	Cowwarr
698	Cedric Dale ..	3	Draught ..	P. O. H. Thomas	Walpeup
1116	" Hero ..	4	" ..	Harditta Singh	Pier Millan
787	Cedric's Son ..	A	" ..	D. Caldow ..	Piangil
1063	Charlie II. ..	A	" ..	C. E. Warren ..	Narioka
675	Cherry Farm Standard	4	" ..	Dyke Bros. ..	Gre Gre Village
970	Cheviot	A	Light ..	M. Zimmer ..	Epping
731	Child Abdallah ..	A	" ..	R. Beyer ..	Seddon
977	Clan Newton ..	6	Draught ..	Bailey Bros. ..	Glenrowan
861	Clarendon II. ..	A	Pony ..	C. Underwood	Timboon
738	Claymore Junior ..	2	" ..	J. P. Hanrahan	Ballan
1064	Clem	A	" ..	M. Skeyhill ..	Weerite
1118	Cleve Todd ..	4	Light ..	T. A. Hardwick	North Essendon
782	Cole's Pride ..	3	Draught ..	W. J. Pethick ..	Adelaide, South Australia
1066	Colonel Young ..	A	" ..	W. H. Twigg ..	Janiember
841	Commonweal ..	A	" ..	W. C. Holt ..	Foster
699	Conqueror.. ..	3	" ..	D. and M. McKinnon	Beazley's Bridge
1128	Coupar's Best ..	3	" ..	Baxter Bros. ..	North Mooroopna
1013	Craigie Masterstroke	A	" ..	F. S. Falkiner and Sons	Boonoke North, N.S.W.
1067	Cronje Wilkes ..	A	Light ..	G. B. Mackie ..	Camperdown
1170	Cutty Sark ..	A	Pony ..	L. Dureau ..	Woodford
862	Cyanide	A	" ..	A. Sutherland ..	Welshpool
1171	Cymro Bach ..	A	" ..	B. Rudduck ..	Melbourne
985	Dale's Pride ..	3	Draught ..	W. P. McCahon	Cope Cope
700	Dalbora	4	" ..	W. Bunworth ..	Watchupga
741	Dalmore Pride ..	3	" ..	Massa Singh ..	Pier Millan
739	Dalmore's King ..	2	" ..	J. G. Bunworth	Donald
701	" Pride ..	4	" ..	R. G. Hynam ..	Patchewallock
989	Dancing Bell ..	A	Light ..	W. C. Marshall ..	Beremboke
742	Dandenong ..	4	Pony ..	R. C. Ladlow ..	Dooen North
863	Dandy Again ..	A	Pony ..	A. Cameron ..	Warracknabeal
788	" " ..	A	" ..	R. Lawler ..	Ouyen
997	" Direct ..	4	Light ..	Wilkinson and Graves	Manangatang
1068	" Jim ..	A	Pony ..	E. McDonald ..	Tangambalanga
1069	" Nut ..	A	" ..	E. Small ..	San Remo
998	" Premier ..	4	Draught ..	R. W. Zirkler ..	Kerang
1196	Dan Patch Junior ..	A	Light ..	J. McCormack ..	Knowsley
864	Defender	A	Draught ..	J. Ballantyne ..	Buln Buln
789	Derby Chimes ..	A	Light ..	H. Saunders ..	Wodonga
836	Direct Alto ..	5	" ..	G. Howells ..	Bridgewater
999	" Kola ..	3	" ..	J. A. Wilson ..	Nyah West
865	" Lulu ..	A	" ..	J. F. Mitchell ..	Burrowye
1070	Director	A	Pony ..	Jos. Hurst ..	Kilmore
1034	Don Alto ..	A	Light ..	G. Maxwell ..	Wangaratta
1071	" Huon ..	A	Pony ..	W. Lyons ..	Drouin
866	" Olive ..	A	" ..	A. Cheesley ..	Barnawartha
1162	" Tourie ..	6	Light ..	J. Dillon ..	Manangatang
702	Donald Dale ..	3	Draught ..	Jas. Frith ..	Torrita

STALLION REGISTER, PART II., 1922–23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1000	Donald's Best ..	5	Draught ..	D. Kelly ..	Kunat
790	Dorregal Chief ..	6	,, ..	C. R. McCallum	Pepper's Plains
676	Douglas Chief ..	5	,, ..	Mitchell and O'Brien	Melbourne
677	Douglas' Heir ..	3	,, ..	Blair and Robson	Melbourne
1138	Dreadnought ..	A	,, ..	C. LeLievre ..	Corack East
867	Duke Little Eyes ..	A	,, ..	A. E. Bowman ..	Tallangatta
791	,, of Melton ..	A	Light ..	Hoysted Bros. ..	Wangaratta
839	,, of Winton ..	3	,, ..	W. C. Bain ..	Winton
1129	,, of Sandmount	4	Draught ..	O. Bassett ..	Sandmount
1197	Dundonald ..	A	,, ..	John Adams ..	Swan Hill
678	Dunure Blend ..	4	,, ..	Hehr Bros. ..	Woolert
792	Eastern Star ..	A	,, ..	D. and G McDonald	Minyip
793	Edgeworth ..	A	Light ..	P. J. White ..	Janiember East
794	Emulator Junior ..	A	Pony ..	J. G. Scott ..	Hopetoun
703	Estelle Junior ..	3	Light ..	D. Green, jun. ..	Nullawil
1130	Everard Bute ..	3	Draught ..	J. G. Bail ..	Kyabram
842	Excel	A	Pony ..	W. C. Holt ..	Foster
679	Fabricate	A	Draught ..	Jas. Maitland ..	"Anama," Hart, N.S.W.
680	Fabric's Heir ..	5	,, ..	Elliott and Dickins	Corowa, N.S.W.
1073	Fairfield	A	Light ..	A. Lenon ..	Cohuna
873	Falmouth ..	A	Thoroughbred	W. R. Cullen ..	Wahgunyah
795	Federal Duke ..	A	Draught ..	Jas. Hendry ..	Bridgewood
601	,, Prince ..	A	,, ..	G. M. Vallence ..	Cohuna
837	,, Sail ..	4	,,	J. D. Rhodes ..	Daysdale, N.S.W.
1074	,, Tax ..	A	,, ..	J. T. Williams ..	Tandarra
796	Federation's Pride ..	A	,, ..	G. East ..	Noradjuha
1075	Field Ambulance ..	A	Light ..	F. Manning, sen.	Stratford
801	Fire Bells	3	,, ..	J. McFarlane ..	Yarraville
797	First Gratton ..	5	,, ..	J. Chisholm ..	Dandenong
781	Flash Cole ..	3	Draught ..	W. J. Pethick ..	Adelaide, S.A.
802	,, Dale ..	2	,, ..	P. Bagnell ..	Mologa
874	,, Dillon ..	A	Light ..	P. Shelton ..	Mordialloc
979	Flower of Moray ..	3	Draught ..	S. J. Allen ..	Nhill
803	Flying Possum ..	5	Pony ..	H. E. Wood and Sons	Mooroopna
804	Foamy Voyage ..	4	Light ..	A. V. Mahar ..	Kerang
838	Freedom Huon ..	6	,, ..	Sullivan and Sons	North Melbourne
603	Garnet	6	,, ..	J. J. Carmody ..	Leongatha
1172	Gay Gordon ..	A	Pony ..	J. R. Mitchell ..	Sandford
604	,, Lad	A	Draught ..	J. Archibald ..	Sale
875	,, Voyage ..	A	Light ..	P. A. Beaumont	Ouyen
704	General Brigham ..	3	Pony ..	N. Gillis ..	Maryborough
1037	,, Kitchener ..	A	Draught ..	D. N. Marshman	Beulah
798	,, R. ..	A	Light ..	L. Welch ..	Gapsted
743	,, Scotch ..	5	Draught ..	J. McIntyre ..	Minyip
681	,, Wallace ..	4	,, ..	J. T. Bartlett ..	Barnawartha
1131	George Wilks ..	3	Light ..	H. D. Adams ..	Kotupna
651	Gillies Son ..	A	Draught ..	Boyd Bros. ..	Koroit
876	Ginger	A	Light ..	D. McLean ..	Chiltern
1076	Giru	A	Thoroughbred	Brig.-Gen. W. J. Clark	Sunbury
799	Gisborne	A	Draught ..	E. Scott ..	Daytrap North

STALLION REGISTER, PART II., 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
605	Gladiator	A	Draught ..	H. Jeitz ..	Rainbow
705	Glen Arthur ..	5	,, ..	C. T. Henderson	Weatherboard
744	,, ,, ..	4	,, ..	A. Arnold ..	Werrigar East
706	,, Direct ..	3	Light ..	P. Whitechurch	Mildura
976	Glendale	4	Draught ..	E. Wright and Sons	Officer
606	Glenmooney ..	6	Light ..	G. H. Palfrey ..	Campbellfield
805	Glenmore	4	Draught ..	A. Colvin ..	Nathalia
609	Glenorchy ..	A	,, ..	H. Hance ..	Lang Lang
610	Glenspean ..	A	Thoroughbred	A. Cameron ..	Warracknabeal
878	Gnarpost ..	6	Light ..	P. B. O'Keefe ..	Rutherglen
745	Gobbler	5	Draught ..	A. Knight ..	Lake Bolac
1077	Golden Action ..	A	Light ..	W. Watts ..	Kamarooka
1173	Gold Tuck ..	A	Thoroughbred	J. J. G. Barns ..	Euroa
746	Grampian Lad ..	3	Draught ..	A. Richards ..	Gymbowen
800	Grattan Bells ..	A	Light ..	T. Shearwood ..	Dooen North
1132	Guy Fox	5	,, ..	H. Maddison ..	Mongan's Bridge
946	Hamilton Emulator Junior	A	Pony ..	Todd Bros. ..	Willenabrina North
1078	,, Hero ..	A	Draught ..	A. Booley ..	Banyan
901	Hamiltonian ..	A	,, ..	A. Steele ..	Woomelang
611	Happy Bells ..	A	Light ..	W. H. Bell ..	Bowser
902	Harold A... ..	A	,, ..	R. M. Smith ..	Landsborough
1038	,, Direct ..	A	,, ..	Joseph Glenn ..	Tylden
879	,, Wilkes ..	A	,, ..	Mrs. P. Shipp ..	Richmond
880	Harvest Again ..	A	,, ..	J. K. Shepherd ..	Ouyen
881	Havoc	A	,, ..	T. S. Cook ..	Willaura
612	Here's Luck ..	A	Pony ..	C. J. Anderson ..	Tarranyurk
613	Hero	A	Draught ..	J. Carruthers ..	Picola West
882	,, ...	A	Pony ..	T. Park ..	Wonthaggi North
1174	,, Laddie ..	A	Draught ..	H. F. Robinson	Kerang
1079	Herward Junior ..	A	Light ..	J. A. Haebich ..	Bittern
903	High Commander ..	A	Draught ..	Griffiths Bros. ..	Greta West
773	,, Commissioner..	5	,, ..	H. Graham ..	Melbourne
823	Highland Chief ..	3	,, ..	E. E. D. White ..	Charters Towers, Qld.
807	,, King ..	4	,, ..	Blair and Robson	Melbourne
904	His Majesty ..	A	,, ..	M. Frawley ..	Leigh Creek
1080	Hivites	A	Thoroughbred	F. N. Heywood	Toongabbie
1198	Holdup	A	Light ..	A. B. Burns ..	Rainbow
905	Honest Cleve ..	A	,, ..	W. Eichler ..	Chillingollah
707	Huon's Joy ..	4	Pony ..	C. S. Wade ..	Bronzewing
1175	I Am Here ..	A	,, ..	A. T. Ingram ..	Orbost
1081	Ian Dhu	A	Light ..	N. C. Gibson ..	Joel South
883	,, McClelland ..	A	Draught ..	H. Naylor ..	Roseberry East
1133	Inverurie ..	2	,, ..	Baker Bros. ..	Rushworth
614	Interest	A	Pony ..	A. Kennedy ..	Arcadia
615	Jack Huon ..	A	Light ..	F. G. Ronalds ..	Buninyong
907	,, Style ..	A	,, ..	P. McEntee ..	Cudgee
1134	,, Tar	3	Draught ..	J. C. Dufty ..	Lorquon West
1051	Jimmy Direct ..	4	Light ..	J. Isaac ..	Inglewood
884	,, Lea ..	A	,, ..	W. Bradshaw, sen.	Skipton
908	Karamu Glenmarkie	A	Draught ..	J. J. Owens ..	Gannawarra
988	Kelly	5	Pony ..	G. F. Schache ..	Jung North
708	Kelmscott II. ..	5	Draught ..	A. W. Lackman..	Murrayville

STALLION REGISTER, PART II., 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
909	Kelm's Pride ..	A	Draught ..	J. Dugdale ..	Myrniong
709	Kelvin	2	,, ..	D. and M. McKinnon	Beazley's Bridge
616	Kemp Daly ..	A	Light ..	G. H. Minns ..	Melton
885	Ki Ki	A	Pony ..	J. T. Laidlaw ..	Chetwynd
747	Killawney ..	3	Draught ..	J. E. Oram ..	Marnoo
617	Kilmore	A	,, ..	J. Russell, jun. ..	Orbost
1082	King Albert ..	A	,, ..	T. McKay ..	Malmsbury
910	,, Bally ..	A	Pony ..	H. Lee.. ..	Smeaton
1176	,, Bronte ..	A	Light ..	C. Hando ..	Charlton
710	,, Dillon ..	3	,, ..	W. Barker ..	Dunolly
1065	King of Clubs ..	A	Draught ..	M. Skeyhill ..	Weerite
975	,, of the Valley ..	A	,, ..	R. and A. McClelland	Lara
1083	,, Stanley ..	A	,, ..	R. J. Green ..	Lurg
1135	,, Victor ..	3	,, ..	A. Dunning ..	Numurkah
987	King's Own ..	3	,, ..	E. Johns ..	Gama
886	,, Pride ..	A	,, ..	C. Nelson ..	Benalla
618	Kingling	A	Thoroughbred	Thornton and Spring	Edenhope
748	Kingslea	4	Light ..	I. N. Hutcheson	Pullut
911	Knight of the Garter	A	Draught ..	P. McDonald ..	Nagambie
912	Laird O'Gowrie ..	A	,, ..	T. Smith ..	Rushworth
619	Lake King ..	A	Thoroughbred	W. J. Smith ..	Yackandandah
1177	Lanark's Pride ..	A	Draught ..	W. Etherton ..	Yanac
711	Langdale	3	,, ..	M. Donnellan ..	Jeffcott North
620	Lee Creek Favourite	A	,, ..	Ewart Bros. ..	Dargalong
913	Leo	A	Pony ..	W. T. Sexton ..	Neerim Junction
859	Lilburne Regent ..	A	Draught ..	J. Hargreaves ..	Dederang
914	Little Argyle ..	A	Pony ..	W. H. Lyon ..	Sale
1084	,, Black Pony ..	A	,, ..	Jessie M. Armstrong	Branxholme
840	,, Eumarrah ..	A	,, ..	R. Painter ..	Leaghur
1117	,, Jack Horner..	A	,, ..	G. H. Curtis ..	Bruthen
1085	,, Mickey ..	A	,, ..	C. Simon ..	Leongatha
887	,, Milton ..	A	Draught ..	Jas. Hives ..	Tempy
621	,, Pos ..	A	Thoroughbred	A. K. Urquhart	Hexham
1119	Llewellyn II. ..	A	Pony ..	M. Fontana ..	Avenel
712	Lonsdale Again ..	2	Draught ..	Dyke Bros. ..	Gre Gre Village
1178	Lord Allan ..	2	,, ..	Vaughan Bros. ..	Nyam
1179	,, Clarrie ..	A	Pony ..	C. C. Dawkins	Lismore
916	,, Glengyle ..	A	Draught ..	W. Linehan ..	Wunghnu
682	,, Lascelles ..	3	,, ..	Sharp and Taylor	South Melbourne
713	,, Nailstone ..	4	,, ..	J. Murphy ..	Murrayville
917	,, Nolan ..	A	Thoroughbred	G. Naylor ..	Rosebery
1086	,, Threave ..	5	Draught ..	T. Thornton ..	Waaia
608	,, Wallace ..	3	,, ..	J. P. Belleville ..	Wallace
922	Lulu's Dandy ..	A	Pony ..	Sir R. T. H. Clarke	Lancefield Junction
918	Lynm Champion II.	A	Draught ..	E. Wilson ..	Leongatha
622	,, Forest Boy ..	A	,, ..	M. Atwood ..	Rosebery
749	Lyndhurst ..	5	,, ..	D. J. McKenzie	Warracknabeal
919	,, II. ..	3	,, ..	A. Arnold ..	Warracknabeal
771	Lyntourie ..	A	Thoroughbred	L. R. Clarke ..	Newstead
714	Macedon Hero ..	5	Draught ..	P. Williams ..	Riddell's Creek

STALLION REGISTER, PART II., 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
888	Mahomet	A	Pony ..	A. Brown ..	Rupanyup
1136	Major Albert ..	4	Draught ..	J. P. Doherty	Rochester
715	" Clyde ..	4	" ..	J. J. Gleeson ..	Corack East
623	" Jock ..	A	" ..	F. C. Glanville ..	Echuca North
1137	" Mark ..	3	" ..	C. H. Feldtman ..	Major Plains
716	Malleepecker ..	3	Thoroughbred	A. T. Finch ..	Speed
1087	Marathon ..	A	Pony ..	J. G. Stewart ..	Hamilton
740	Marcellus II. ..	2	Draught ..	J. Bunge and Sons	Sheep Hills
889	Maringa	A	Light ..	E. Collins ..	Dunkeld
920	Markhope ..	A	Thoroughbred	Trustees Rupert J. Clarke	Lancefield Junction
923	Marshal Clyde ..	A	Draught ..	Jas. Nunn ..	Birchip
624	Master Brigham ..	A	Pony ..	A. E. Harding ..	Whorouly South
890	" Vengeance ..	A	Light ..	W. Bradshaw ..	Skipton
1023	Mauritius	A	" ..	J. B. Zander ..	Melbourne
750	McAgain	4	Draught ..	W. G. Burns ..	Goroke
683	McIvor	4	" ..	Blair and Robson	Melbourne
891	Merrimu	A	Light ..	G. M. Vallence ..	Cohuna
1139	Merry King ..	A	Pony ..	W. F. Maroney ..	Wangaratta
751	" Lad ..	3	Draught ..	Thos. Sweeney ..	Boolite
892	" Oliver ..	A	Thoroughbred	E. R. de Little ..	South Caramut
625	Michael	A	Pony ..	Mrs. Bell ..	Flynn
1088	Mickey	A	" ..	R. Booley ..	Banyan
924	Middlemarch ..	A	Draught ..	M. J. Egan ..	Charlton
684	Middlerigg Referee ..	3	" ..	O. Deutscher ..	Murtoa
894	Minstrel	A	Pony ..	D. Begley ..	Colac
949	Model's Fancy ..	A	Draught ..	Hutcheson Bros.	Pine Grove
774	Moeser	5	" ..	J. Tallent ..	Craigieburn
808	Morocco Sport ..	2	" ..	C. Hewitt and Sons	Werrigar East
1042	Mountain Chief ..	A	" ..	J. M. Connelly ..	Birchip
925	" Palm ..	A	Light ..	J. Stephens ..	Northcote
1047	Moving On ..	3	" ..	H. Fisher ..	Yaapeet
926	Musket Bells ..	A	" ..	J. H. Latta ..	Derrinallum
1089	Napar	A	" ..	E. Tozer ..	Porepunkah
752	Newfields Pride ..	4	Draught ..	J. Martin ..	Aubrey-road
685	Newton Bold ..	3	" ..	H. Wills and Sons	Perth, W.A.
1090	" Lad ..	A	" ..	T. N. Skinner ..	Bordertown
895	Newton's Sensation	A	" ..	R. Banko ..	Simmies
927	" Stewart ..	A	" ..	A. H. Borgelt ..	Tarranginnie
626	" Style ..	5	" ..	Currell Bros. ..	Cobden
1140	Niggering	3	Light ..	E. G. Traeger ..	Merbein South
843	Nigger Minstrel ..	5	Thoroughbred	D. W. Heaney ..	Benalla
844	Non Pareil ..	4	Draught ..	W. Geddes ..	Boomahnoo-moonah
1091	Norfolk Swell II. ..	A	" ..	H. McLean ..	Sale
717	Norman's Pride ..	2	Pony ..	A. Harrington ..	Leigh Creek
753	Northcote ..	2	Draught ..	J. R. Thompson	Myrniong
1141	Novel Print ..	3	Light ..	P. Maher ..	Tatura
754	Nyallo Prince ..	5	" ..	W. T. McAlpine..	Hopetoun
928	Oakburn	A	Draught ..	C. A. Roberts ..	Glenalbyn
1092	Oakwood	A	Light ..	Geo. Inglis ..	Tallygaroopna
628	" Direct ..	6	" ..	A. McCracken ..	Barry's Reef
929	Onward	A	Draught ..	H. T. Wilson ..	Wodonga
1093	" Star ..	A	" ..	J. W. Murchison	Dunbulbalane
896	Orbost Again ..	A	" ..	G. H. Deckert	Kinimakatka
930	Our Bobby ..	A	Pony ..	W. H. Gardiner	Lurg

STALLION REGISTER, PART II., 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
822	Our Guide ..	A	Light ..	Geary Bros. ..	Tungamah
931	Owyhee Chief ..	A	,, ..	J. Shanahan ..	Richmond
1180	O.Y.D.	A	,, ..	P. Lyon ..	Eddington
607	O.Y.K.	A	,, ..	G. H. Palfrey ..	Campbellfield
629	Paceaway ..	A	,, ..	T. H. Clyne ..	Echuca
1142	Palais Danse ..	4	Thoroughbred	D. W. Heaney ..	Benalla
1094	Palos	A	Light ..	R. Warren ..	East Geelong
630	Papakaio	A	Draught ..	A. B. C. Dripps	Nathalia
897	Patrician Pride ..	5	,, ..	W. E. Bryce ..	Traynor's Lagoon
898	Patrobas	A	Thoroughbred	Mrs. Widdis ..	"Nambrok," Rosedale
1095	Peter	A	Light ..	J. Carroll ..	Mudgegonga
932	Petrillott	A	Thoroughbred	R. Barr Smith ..	Willaura
1039	Pettadale	A	Draught ..	N. Ramsay ..	Newbridge
631	Phylactery ..	A	Thoroughbred	A. B. Gibbons ..	Cohuna
632	Pirateer	A	Light ..	D. McArthur ..	Victoria Valley
633	Plumlea	A	,, ..	P. Fischer ..	Jeparit
1001	Pompy	6	Pony ..	E. H. B. Cleeland	Newhaven
1045	Powisland Pure Blood II.	A	Draught ..	W. Bolton ..	Girgarre East
893	Predominate ..	A	Light ..	E. R. de Little ..	South Caramut
1181	Premier Lauder ..	A	Draught ..	P. Kelleher ..	Baddaginnie
1182	,, Ward ..	A	,, ..	J. A. and R. Jobling	Mumbel Plains
1002	Preston	A	Pony ..	E. McEvoy ..	Colbinabbin
933	,, Junior ..	A	Light ..	J. McLure and Son	Drummond
1096	Pretty Bobby ..	A	Pony ..	W. and W. G. Hall	Talbot
1041	Pride	A	,, ..	W. A. Cardwell ..	Tallangatta
634	,, of the Ponds ..	A	Draught ..	E. Drayton ..	Waurn Ponds
772	Prince Alexander II.	A	,, ..	Stokes and Caffrey	Melbourne
1097	,, Benmore ..	A	,, ..	W. D. Starbuck ..	Rupanyup
1098	,, Charles ..	A	Pony ..	J. Dawkins ..	Colac
635	,, Coupar ..	A	Draught ..	L. Clarke ..	Newstead
934	,, Douglas ..	A	Light ..	P. Martin ..	Molesworth
969	,, Edward ..	A	Draught ..	D. King and Sons	Rutherglen
1003	,, Ettrick ..	A	,, ..	A. R. Paynter	Violet Town
1143	,, Hamilton ..	4	,, ..	C. J. Warren ..	Boinka
935	,, Harold ..	A	Pony ..	H. Robertson ..	Wallacedale
1046	,, Henry ..	A	Draught ..	P. Stratton ..	Turriff East
1099	,, Que ..	A	Pony ..	A. E. Callow ..	Ballarat
755	,, Robert ..	3	Draught ..	Theo. Bunge ..	Sheep Hills
756	,, Wigton ..	2	,, ..	P. Shanahan ..	Myrniong
1100	Prince's Ribbon ..	A	Light ..	W. A. Riedell ..	Tongala
1004	Punch	A	Draught ..	E. H. B. Cleeland	Cowes, Phillip Island
936	Quamby ..	A	Pony ..	P. McEntee ..	Cudgee
1144	Quatta's Baron Belmontian	5	Draught ..	R. F. Carmody	Everton
809	Real Scotch ..	5	,, ..	J. Rumbold ..	Laanecoorie
1005	Red Wilkes ..	A	Light ..	E. Rash ..	Ballarat
636	Reform ..	A	,, ..	J. Branson ..	Lake Cooper
1006	Regis	A	Draught ..	E. Manifold ..	Camperdown
1145	Reisorel	4	Light ..	W. G. Parish ..	Horsham
686	Review	3	Draught ..	A. Stewart ..	Donald
638	Rhymney II. ..	A	Pony ..	G. Roberts ..	Goroke

STALLION REGISTER, PART II., 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
1102	Ribbon Wheel ..	A	Light ..	V. Vaughan ..	Condah
1007	Richard Cleve ..	A	,, ..	G. E. Hodgins ..	Hastings
639	,, III. ..	A	Pony ..	A. Ruttle ..	Inverloch
1199	Rifle Boy	A	,, ..	P. R. Cooke ..	Euroa
757	Ripple Pride ..	3	Draught ..	D. L. Bodey ..	Jung
759	Rising Star ..	4	,, ..	E. Pearse ..	Rupanyup
953	Robert Alto ..	A	Light ..	A. Kennedy ..	Arcadia
810	,, Bruce ..	4	Draught ..	R. C. Gulliver ..	Balldale, N.S.W.
937	Robin Roy ..	A	Light ..	C. Paulin ..	Port Melbourne
650	Rob Shanter ..	A	Pony ..	Boyd Bros. ..	Koroit
1048	Romlad	3	Draught ..	M. Schultz ..	Warracknabeal
811	Roseleigh's Viceroy ..	3	,, ..	Gange Bros. ..	Mininera
812	Roseworthy ..	5	Light ..	C. S. Walker ..	Swan Hill
1008	Rothmont.. ..	6	,, ..	J. A. Kirkpatrick	Lismore
646	Roy	A	Pony ..	J. B. Cleeland ..	Newhaven
971	Royal Agitation ..	3	Draught ..	A. Gillis ..	Newmarket
938	,, Bob ..	A	,, ..	J. Parle ..	Carwarp
760	,, Bute ..	4	,, ..	G. Luckie ..	Springhurst
1146	,, Charm ..	3	,, ..	J. R. Stokes ..	Abbotsford
983	,, Comedy ..	5	Thoroughbred	A. Sutherland ..	Welshpool
1147	,, Craig ..	4	Draught ..	D. Trewick ..	Elmore
1009	,, Douglas ..	A	,, ..	T. Thornton ..	Waaia
1183	,, Escort ..	A	,, ..	T. Casson ..	Pinnaroo, S.A.
939	,, Flush ..	A	,, ..	M. Colton ..	Terang
1010	,, Gartley ..	A	,, ..	C. P. Butler ..	Warracknabeal
846	,, Hero ..	4	,, ..	J. Hoban ..	Alexandra
1011	,, Lad ..	A	,, ..	R. Martin ..	Navarre
718	,, McGregor ..	4	,, ..	Vallance Bros. ..	Nullawil
1148	,, Main ..	3	,, ..	A. J. Trevaskis ..	Murchison
813	,, Rufus ..	5	Light ..	L. Morrison ..	Yarraville
1149	,, Scotty ..	3	Draught ..	S. Fawcett ..	Numurkah
762	,, Seal ..	3	,, ..	J. Dugdale ..	Myrniong
821	,, Sovereign ..	A	Light ..	C. Ridley ..	Northcote
940	,, Standard ..	A	Draught ..	Les Hay ..	Cobram
1012	,, Style ..	A	,, ..	McQueen Bros.	Waubra
1049	,, ,, ..	3	Light ..	Jno. Isaac ..	Inglewood
641	,, Whips ..	A	,, ..	A. J. Walter ..	Warragamba
942	Rufus	A	Thoroughbred	K. Urquhart ..	Hexham
642	R. W. Estell ..	A	Light ..	A. E. Lobb ..	Lamplough
1150	Safe Voyage ..	4	,, ..	D. Murchison ..	Katamatite
814	Sailor Voyage ..	5	,, ..	R. Johnson ..	Bendigo
941	Salient ..	A	Pony ..	L. J. Weatherly ..	Mortlake
643	Sam Huon ..	6	Light ..	J. P. O'Brien ..	East Melbourne
944	Sarsfield	A	Pony ..	C. W. Heaney ..	Kilmore
1103	Satellite Junior ..	A	,, ..	Saunders Bros. ..	Yourang
1151	Satellite's Pride ..	A	Light ..	R. Berry ..	Navarre
644	Scotland's Bloom ..	A	Draught ..	J. K. Shepherd ..	Ouyen
945	,, Viceroy	A	,, ..	Todd and Allen	Willenabrina
763	,, Victory	2	,, ..	J. S. Gray ..	Sheep Hills
764	Scottish Admiral ..	3	,, ..	A. E. Petering ..	Box 53, Minyip
687	,, Fashion ..	A	,, ..	H. Wills and Sons	York, W.A.
974	,, Peer ..	6	,, ..	Tyrell Downs As. P. Coy.	Sea Lake
1104	Scotty	A	,, ..	P. Bagnell ..	Mologa
1105	Seacombe ..	A	Pony ..	E. G. Gibbs ..	Sale
1014	Seldom Seen ..	3	Draught ..	H. B. Lee ..	Clunes
947	Selkirk	A	Light ..	A. Scott ..	Elmore

STALLION REGISTER, PART II., 1922–23—*continued.*

Cert. No.	Name.	Age	Class.	Owner.	Address.
		Yrs.			
815	Selsiam	2	Light ..	T. Edson ..	Glenorchy
645	Seymour	A	Draught ..	J. Cleeland ..	Newhaven
816	Shanter's Pride ..	5	,, ..	G. A. Thompson	Kyneton
1015	Shifty Dick ..	A	Light ..	J. T. Neeson ..	Nareen
1050	Signet	5	Draught ..	J. Roberts ..	Kunat
688	Silver Bannerman ..	3	,, ..	Mitchell and O'Brien	Melbourne
948	,, Claim ..	A	Thoroughbred	M. Hutcheson ..	Pine Grove
1040	,, King ..	A	Pony ..	J. Robertson ..	Lake Boga
765	,, Star ..	3	Draught ..	D. L. Bodey ..	Jung
719	Simon Again ..	3	,, ..	G. J. Butler ..	Carisbrook
899	Sir Amyas.. ..	A	Thoroughbred	Mrs. Widdis ..	"Nambrok," Rosedale
647	,, Angle ..	A	Light ..	L. S. Cadman ..	Corryong
982	,, Armadale ..	3	Draught ..	R. and A. McClelland	Lara
648	,, Burnhead ..	A	,, ..	Boyd Bros. ..	Koroit
720	,, Dale	4	,, ..	A. Sands ..	Sea Lake
1016	,, Don Pedro ..	A	,, ..	J. McKee ..	Clarendon
1017	,, Douglas Haig ..	A	,, ..	Mrs. J. Biddlecombe	Shelford
1018	,, George.. ..	6	,, ..	E. J. Griffiths ..	Tongala
652	,, Mac	A	,, ..	W. Blake ..	Rushworth
986	,, Richard 2nd ..	A	Pony ..	W. Henderson ..	Grasmere
1152	,, Robert Newton	5	Draught ..	P. Lawrie, jun.	Rushworth
915	,, Thomas ..	A	,, ..	W. H. Lyon ..	Sale
1106	,, Whyee.. ..	A	Light ..	W. E. Johnstone	Woodford
845	,, William ..	4	Draught ..	McQueen Bros.	Waubra
950	,, ,, ..	A	,, ..	W. A. McClellan	Bungaree
951	Skipper	A	Pony ..	G. Hicks ..	Strathallan
1107	Smart Style ..	6	Light ..	R. Davis ..	Kunat
766	Southern Lad ..	5	Draught ..	G. McKenzie ..	Pullut
1019	Southerton ..	A	Light ..	F. Mason ..	Stawell
654	Splendour ..	A	,, ..	J. McKenna ..	Picola
952	Sportsman's Hero ..	A	Draught ..	A. Kennedy ..	Arcadia
653	Springbank Lawrence	A	,, ..	W. H. Crawford	Hamilton
1154	Squire Belmont ..	3	,, ..	J. M. Phillips	Congupna-road
1108	Standard	A	,, ..	A. Rees ..	Casterton
954	St. Aidan ..	A	Light ..	M. Cribbes ..	Faraday
1109	Standard	6	Draught ..	J. G. Scott ..	Hopetoun
758	Star's Heir ..	3	,, ..	D. L. Bodey ..	Jung
721	Stivious	3	Light ..	A. W. Lackman..	Murrayville
767	Stockman's Lad ..	4	Draught ..	J. F. A. Schulz	Jeparit
722	Stokes' Fancy ..	6	,, ..	L. M. Simon ..	Pinnaroo, S.A.
723	Strathvale ..	3	Pony ..	V. R. Griffin ..	Underbool
689	,, Fancy ..	3	Draught ..	Blair and Robson	Melbourne
1153	Sturdy	5	,, ..	C. T. Burns ..	Tarrita
1155	Sultan	3	Light ..	M. Swan ..	Avenel
1200	Sunbeam	A	Pony ..	D. Ahern ..	Wahring
955	Superior	A	Light ..	D. Tallent ..	Underbool
1020	Taffy	A	Pony ..	T. J. Morrissey ..	Beeac
1021	Take Bells ..	A	Light ..	J. Ferguson ..	Redesdale
956	Tam O'Shanter Bill	A	Pony ..	P. Gordon ..	Ellerslie
1156	Tamie O'Groat ..	4	Draught ..	A. L. Pitts ..	Merrigum
817	Tenor Voyage ..	3	Light ..	F. Siebel ..	Thomastown
1022	Territorial.. ..	A	Draught ..	R. M. Thomas ..	Devon North
973	The Banker ..	3	,, ..	A. Templeton ..	Coleraine

STALLION REGISTER, PART II., 1922-23—*continued.*

Cert No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
943	The Bard	A	Draught ..	L. J. Weatherly..	Mortlake
957	" Crown ..	A	" ..	S. Atwell ..	Rainbow
1184	" Fashion ..	A	" ..	R. Dyson ..	Dromana
1024	" General ..	A	" ..	J. Lord ..	Boigbeat
563	" " ..	A	" ..	Wm. Lincoln ..	Portarlington
1025	" Knight ..	A	" ..	W. Pharaoh ..	Warragul
1026	" Macdonald ..	A	" ..	A. Wohlers ..	Mt. Wallace
1061	" Masher ..	A	Light ..	W. Williams ..	Strathmerton
825	" " ..	A	Pony ..	W. N. MacNicol..	Casterton
1112	" Nipper ..	A	" ..	T. H. Bush ..	Pennyroyal
958	" Retainer ..	A	Light ..	G. Forrester ..	Curyo
1110	" Scrip	A	Thoroughbred	H. McInnes ..	Ararat
1035	" Stewart ..	3	Draught ..	Mitchell and O'Brien	Melbourne
1111	" Trick ..	A	Light ..	W. Mellington, jun.	Rainbow
872	" Verger ..	A	" ..	W. R. Cullen ..	Wahgunyah
655	This Time ..	A	Pony ..	H. Hance ..	Lang Lang
649	Tommy	A	" ..	Boyd Bros. ..	Koroit
656	" Alto ..	4	Light ..	J. Boulter ..	Adelaide, S.A.
724	" Burns ..	4	Draught ..	W. Cook ..	Speed
1185	" Huon ..	A	Light ..	J. Watkins ..	Euroa
906	Tom Thumb ..	A	Pony ..	W. F. Eichler ..	Chillingollah
657	Tony	A	" ..	D. J. Kennedy ..	Cobram
658	Towyvale Flyer ..	A	" ..	W. J. Cadman ..	Thougla
959	Tracey Alto ..	A	Light ..	A. J. Skene ..	Beaufort
868	" Boy ..	A	" ..	Turner Bros. ..	Mernda
848	" Voyage ..	4	" ..	Mackin Bros. ..	Korong Vale
1027	Tramore	A	Thoroughbred	McDonald Bros.	Mortlake
1186	Tra George ..	A	"	James and Wall	Leongatha
869	Tresco	A	Light ..	A. E. Bowman ..	Ebden
659	Truro	A	" ..	J. E. Light ..	Quantong
660	Union	A	Pony ..	W. A. Anderson	Allansford
960	Vanguard ..	A	Draught ..	G. and W. Lord..	Rosedale
1028	Venerror	A	Light ..	J. C. Wallis, sen.	Miram
761	Vice Royal ..	3	Draught ..	Warwick Stud Farm	Swan Hill
856	Viking	A	Light ..	A. G. Turnbull ..	Horsham
1029	Vocal King ..	A	Thoroughbred	A. W. Giddings ..	Sea Lake
1113	Wakepan ..	A	Light ..	A. W. Johnston	Eldorado
1187	Wallae	A	Thoroughbred	A. C. Mason ..	Shepparton
661	Wee Jim	6	Pony ..	E. R. Pickering	Portarlington
961	Welcome Abbey ..	A	Light ..	W. Haymes ..	Ballarat
662	" Bells ..	6	" ..	T. J. Splatt ..	Weering
870	Weralte	A	Pony ..	A. E. Bowman	Ebden
962	Western Lad ..	6	Draught ..	A. Knight ..	Lake Bolac
1157	White Star ..	5	Light ..	Geo. Kelly ..	Powlett Plains
1120	Whiz Bang ..	6	Thoroughbred	J. I. Watson ..	Elsternwick
818	Who's Who ..	4	Pony ..	Sobee and Smith	Melbourne
627	Widgiewa Cavalier ..	A	Draught ..	W. G. Wilkinson	Yarrawonga
981	" Chief ..	3	" ..	S. J. Lynn ..	Orbost
1158	" Edward ..	3	" ..	W. G. Down ..	Koonda
1159	" Fashion ..	3	" ..	J. A. Tweddle ..	Waaia
847	" Ivo ..	4	" ..	W. G. Wilkinson	Yarrawonga
1160	" Marshal ..	3	" ..	Jno. Christie ..	Katunga
726	" Sapper ..	5	" ..	F. J. J. Schultz	Cowangie
963	Wiewood ..	A	Light ..	W. Raftery ..	Shepparton
980	Wigton Again ..	A	Draught ..	C Murphy ..	Oxley

STALLION REGISTER, PART II., 1922-23—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
727	Willie Craig	4	Draught	G. Oxley, jun.	Gre Gre North
690	,, Douglas	3	,,	Blair and Robson	Melbourne
1030	Winter Wild	A	Light	F. A. Mitchell	East Malvern
964	Wizard Junior	A	Pony	J. A. Goodwin	Wunghnu
965	Wonder	A	,,	Wm. McEvoy	Alexandra
769	Woodlands Beauty	5	,,	E. Fulton	Horsham
1161	Yarram	3	Draught	W. C. Murray	Ballendella
1114	Yorkie II.	A	Light	G. J. McVean	Thougla
1188	Young Albyn	A	Draught	J. Watkins	Euroa
1031	,, Coronation	A	,,	W. J. Bennett	Cannie
1189	,, Croydon	A	,,	D. Blair	Terrappee
966	,, Estell	A	Pony	John Falla	Donald
819	,, Hamilton Hero	4	Draught	Bateson Bros.	Cowangie
637	,, Hero	A	,,	J. Branson	Lake Cooper
1032	,, ,,	A	Pony	F. W. Hender	Franklinford
1115	,, Linkwood	A	Draught	J. H. Peverill	Charlton
663	,, Lord Lyon	A	,,	N. Chamberlain	Morwell
664	,, Lowrie	A	Pony	K. McPherson	Broadford
1033	,, Major	6	Draught	C. Gould	Tatyoon
728	,, Repeater	6	,,	R. N. Johns	Danyo
967	,, Rysharold	A	Pony	W. F. Brown	Fitzroy
770	,, Shepherd	5	Draught	G. Chapman	Minyip
729	,, Sportsman	4	,,	W. Reid	Birchip
665	,, Sunbeam	A	Pony	J. M. Ferris	Terrick Terrick

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

SPRAYING.

The spray pump should now be in thorough working order, so that the various spring sprayings may be carried out with as little interruption as possible. It is always wise to clean out the pump after each spraying, so that it will be ready for the next mixture. Putting a different spray in a pump barrel that has not been washed out, very often causes the formation of a sediment, which blocks the nozzle and interrupts the work.

During November it will be necessary to spray for codlin moth, peach aphis, pear slug, and various leaf-eating insects. In addition, black spot of the apple and pear, shot hole, and other fungus diseases must be kept in check. As various sprays are required for all of these troubles, the necessity of always having a clean pump is evident.

At the present time the best spray for peach aphis is strong tobacco solution, and the same spray may also be used for the pear slug. Arsenate of lead is the better spray for this latter insect, but it should not be used when the fruit is approaching the ripening stage; hellebore may also be used for the slug with good effect.

As a preventive against codlin moth, the trees should be kept well sprayed with arsenate of lead. The first spraying should have been given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that the grower must use his own judgment as to the necessity for subsequent sprayings. If the moths be at all prevalent, other sprayings will be quickly necessary.

As the woolly aphis is increasing at this time of the year, it will mean a saving of a large number of buds if this insect be sprayed. Nicotine solution, pine spray, or lime sulphur may be used with good effect.

Cultivation.

The work of ploughing and harrowing should be completed immediately. All crops for green manure should be now under cover, and if the orchard soil is at all heavy or stiff, the grower should make up his mind to grow a crop next season, in order that this condition may be reduced.

The orchard should be kept free from weeds, not only for the conservation of moisture, but in order to do away with all hiding places of the Rutherglen fly, cutworm moths, &c.

General Work.

Grafted and newly-planted trees should be frequently examined, and given an occasional watering and overhead spraying, in order to encourage their growth, and to prevent loss of moisture from the foliage. It is also advisable to mulch young trees with light grass, or straw mulching not too rich in animal manure.

The disbudding of unnecessary shoots and the pinching back or stopping of growths, to prevent their becoming unduly long, may now be carried out. This work is particularly important on young trees.

Graft ties should be examined, and the ties cut wherever any growth is being made. Where the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, and, after planting, they should be watered and mulched.

The Vegetable Garden.

Tomato plants should now receive attention every day; laterals will require pinching back; crowded bunches and shoots should be thinned; the plants should be well tied to the stakes, and liberal supplies of water and manure should be given. One or two more plantings of tomato plants may still be made, so that there may be strong, sturdy plants for the production of late fruits. By planting three or four successions of plants, it is possible to have a good supply of fruits from December to June. Pull up and burn all plants showing any signs of disease.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, pumpkin, and all seeds of this family may now be sown in the open.

Where these plants are already growing, the longest and strongest runners may be pinched back, to throw the strength into flowering and lateral growths. Watch the plants for mildew, and use sulphur freely wherever present, especially on the young plants.

Peas, lettuce, radish, turnip, cabbage, and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it would be well to dip the whole plant in water before planting This greatly assists the young plants while taking hold of the soil in their new location.

Frequent waterings and frequent cultivation will now be necessary; and all weeds must be hoed or hand-weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. These plots will then be ready for the celery, cabbage, and other seeds planted during this month.

The Flower Garden.

Continue to plant out the various bedding and foliage plants, corms of gladioli, and seed of such tender annuals as Phlox Drummondi, balsam, zinnia, nasturtium, celosia, aster, cosmos and portulaca.

While seeds planted out in the open germinate and grow fairly well, it is advisable during the summer months to plant these in sheltered seed beds, or in a canvas or calico frame. The protection need be on the one side only, preferably the west or north-west; the seedlings are then protected during the hottest part of the day. At the same time the shading should not be sufficient to unduly " draw " them.

The seeds should not be deeply sown, and all waterings should be light. A little water, often, should be the rule for seedlings. Annuals require plenty of room when planted out in the garden. Being quick growers, they are generally gross feeders, and they must have space to develop a good root system. Feeding, too, with liquid manure is helpful when they are reaching the flowering stage.

Dahlias may now be planted out, either from tubers or from young rooted cuttings. These will give good early summer blooms. For autumn and show blooms, the planting should be deferred until the middle of December.

Herbaceous and succulent plants should be staked for protection; included in this section are delphinium, gladiolus, perennial phlox, rudbeckia, &c. These plants will all benefit from liberal mulchings and watering with liquid manure when approaching the blooming period. Spring flowering bulbs, corms, and tubers should now be lifted and stored.

The soil surfaces will now benefit from frequent hoeings and stirrings. Constant waterings will be required if the weather be hot or windy. the cultivation should quickly follow the waterings in order that the moisture may be thoroughly conserved. Mulching with stable manure is also beneficial at this season.

REMINDERS FOR DECEMBER.

LIVE STOCK.

Horses.—All farm horses in constant work at this season should be well fed with last year's chaff or a mixture of old and new, to which a liberal supply of oats has been added. New chaff or hay alone is not recommended, as it has

not the sustaining powers of old hay, and is liable to give rise to digestive troubles. Horses require water at frequent intervals; keeping them for a long time without water, and then allowing them to drink to excess is injurious.

An occasional feed of green stuff will be beneficial. In the event of this being unobtainable, give at week-ends a bran mash, to which is added five or six packets of Epsom salts.

Mares which are away from foals for any length of time should have a portion of milk taken from them before foal is allowed to run with them, otherwise serious results may accrue to foal. Good results follow an allowance of chaff and oats to mares and foals running in paddocks, more especially where feed is short.

At this season the Bot Fly is about, and horses should be frequently examined for the eggs of this fly. The neck, forelegs, and jaws are the parts where the eggs are deposited. Either the use of the singeing lamp under affected parts or the application of kerosene will destroy the eggs.

CATTLE.—Provide succulent fodder and plenty of clean water and shade. The silo is the cheapest method of providing succulent fodder, silage costs less than 10s. per ton to grow and save. Mow and make hay of as much grass as possible. This will keep indefinitely so long as it is protected from the weather. Mice will not work in it. Limewash the cowbails, it helps to keep down flies. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron ½ lb. Look out for milk fever. Read up method of treatment in *Year-Book of Agriculture*, June, 1905. Have cows' milk weighed, and tested for butter fat. Rear heifer calves from cows giving satisfactory results. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Give half-a-cup of limewater in the milk to each calf. Let them have a good grass run or lucerne, or ½ lb. crushed oats each per day in trough. Dehorn all dairy calves, except those required for stud or show purposes.

PIGS.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water. Read Bulletin No. 16. Pig raising and fattening with present price of pollard and bacon should be profitable.

SHEEP.—Dispose of all faulty-mouthed ewes, inferior-fleeced wethers, and coarse-flock sorts in best condition at any time possible. Those in favoured areas can replace with younger, better, finer-grade sorts. Where ewe lambs are intended to be held for future breeding, see that the cross results in shafty, fine to medium grade fleeces, as well as a shapely frame. Allow rams to remain with the ewes seven weeks, this period admitting of any ewes coming in season the second time. It is rarely necessary to join more than 3 per cent. of 2 tooths, 3 per cent. of 5 and 6 year olds, or 2 per cent. of 2, 3 and 4 year old rams, unless with young ewes. Where conditions justify it, 4 per cent. of vigorous matured rams with aged coarse crossbred ewes will bring a greatly increased number of twin lambs. Clear wool from eyes, and burrs from about the pizzles of rams, and cut hoofs into shape before mating. Ewes should be of one breed, or as near one cross as possible, to insure an even and rapid dropping. Merino and fine cross ewes are in season earliest, first cross or half-breds later, and all ewes with a preponderance of British blood later still. It is useless to join rams with ewes until their proper time of coming in season. Ewes carry their lambs four months, four weeks, four days, or roughly, five months.

POULTRY.—Add a little peameal to morning mash and give less bran. Feed equal parts wheat and heavy oats at night. Supply plenty of green food—at this time, lettuce is invaluable. Avoid salt meat of any description. Put Douglas mixture in drinking water when required. Keep ample supplies of sand, ashes, &c., in pens, and moisten same. This will enable the birds to keep themselves cool and clean. Top off geese, ducks, and cockerels for the Christmas markets. Hens will do better this month by having free range. Remove all male birds from flocks, as infertile eggs will keep longer and command a higher price.

BEE-KEEPING.

December is the month for the main honey flow from yellow box and red gum. Swarming is practically over for the season except, perhaps, in late districts. Where there has been more swarming than the owner of the bees desired, and

the total yield of honey is the object aimed at rather than increase in the number of colonies, the weaker stocks may be united at the commencement of the honey flow, as the highest return is secured by having a given number of bees in the fewest possible number of hives; that is to say, 50,000 worker bees in one hive will store a far greater amount of honey than the same number in two hives with 25,000 bees in each. Such a large worker-force requires three bodies of full-depth frames, otherwise the best results cannot be obtained, because nectar being as thin as water when brought in by the bees, only a little is put into each cell to hasten evaporation. When, therefore, sufficient empty combs are not available to the bees, part of the worker-force will be idle.

Each colony should have at least three sets of Langstroth size combs, and when these are not available the time of the red gum honey flow is suitable for getting new combs drawn out from full sheets of foundation. Comb foundation is expensive, but in the end combs built from starters are more expensive still. because so much drone comb is built when starters only are given, that one of the principal advantages of the frame-hive system is lost.

All frames should be wired, four horizontal wires being most in favour with beekeepers; the wires should be well embedded into the foundation so that it may not come away from them. Between the bottom edge of the sheet of foundation and the bottom bar of the frame there should be a space of at least ¼-inch, to allow for the expansion of the sheet by the heat of the hive.

The best combs are obtained when the foundation is drawn out by the bees in the super immediately over the brood nest without an intervening excluder.

Combs should be capped at least two-thirds before being extracted, so that the honey will be of good density. When hives are run three stories high, as indicated above, there is no necessity to extract all the honey at one time; one set of combs can be extracted, and the empty combs returned to the hive, and when they are partly filled again the others can be taken. In this way the bees are not upset so much as when all the combs are wet and sticky after extracting. and the risk of leaving the hive destitute of stores is avoided should the honey flow suddenly cease.

CULTIVATION.

Farm.—Cut hay in late districts. Cut oats and barley in early places Finish planting potatoes. Put in late maize for fodder, also millet and imphee. Plough fire-breaks where required. Get stackyard and stages ready for hay.

Orchard.—Keep the surface loose and free. Suppress weeds. Spray as often as necessary for codlin moth and pear slug. Mulch and spray young trees and grafts with water in the early morning during hot weather.

Vegetable Garden.—Keep the surface hoed, and allow the plants plenty of moisture. Stake, pinch out, manure, and water tomatoes. Pinch back long runners of pumpkin and melon family. Sow autumn and winter varieties of cabbage and cauliflower. Plant out seedlings in cool weather. Sow French beans. Cease cutting asparagus beds, and top-dress with manure.

Flower Garden.—Plant out dahlias and gladioli for autumn blooming. Lift and store spring flowering bulbs. Stake, tie, and train growing plants. Sow zinnias and asters. Layer carnations, camelias, daphnes, &c. Water well and keep the surface loose. Keep rose beds fairly dry.

Vineyard.—Inspect young grafted vines (field or bench); suckering and removal of scion roots should be carefully attended to—See *Bulletin No.* 38 (Spring Grafting), obtainable on application. Tie up young vines. Beware of cut worms on young vines (information concerning this pest posted on application). Tying up of bearing vines, if practised, should be completed early in month. Avoid excessive and indiscriminate topping, far too frequent in Victoria. Scarify, if soil is not sufficiently loose, and after heavy rain or irrigation. Look out for oidium and repeat sulphurings on first appearance of disease. Further spraying for Downy Mildew will be needed if weather conditions favour the fungus.

Cellar.—Fill up regularly and keep cellars as cool as possible.

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DAIRY FARMING.

(Continued from page 656.)

By R. T. Archer, Senior Dairy Inspector.

Milking by Machine.

Labour in connexion with dairying becomes more difficult to obtain year by year, and in many cases it would be practically impossible to carry on but for the aid of the milking machine. No one will claim that the machine is as satisfactory as good hand-milking, but it will be better than poor hand-milking, and much of the hand labour available at the present time is of the latter order. The machine also makes one largely independent of hired labour, which is of great importance. A man will not find it difficult to milk 40 cows or so with the machine, whereas it would be very difficult for him to milk half that number by hand for any length of time. Milking machines are more largely used in New Zealand than in Victoria, and I understand that over 90 per cent. of the cows in some districts there are machine-milked.

There are many machines on the market now which give satisfaction, provided they are properly managed, particularly in regard to cleaning. This must be regularly and properly done, or the results will be disastrous. On the other hand, when proper methods of cleansing are attended to, the milk produced by the aid of the machines will be cleaner than that produced by hand. This is well illustrated by the excellent results of the operations at the Talbot Farm, Cranbourne.

Effect on the Cows.

It is conceded that cows milked by machine suffer less from sore teats than those milked by hand. Some farmers blame milking machines for the spread of contagious mammitis, but this is just as likely to occur in cows that are hand-milked, and precautions are equally necessary whether a herd is milked by hand or by machine.

Cows suffering from mammitis should be milked last and by hand into a bucket containing disinfectant, such as lime, or phenyle. A diseased quarter should never be milked on to the ground, as the germs may adhere to the dust and be carried on to other cows' teats and thus the infection be spread. There is no proof that the yield of milk is detrimentally affected, but there is no doubt that the machine is more satisfactory with heifers broken in to it than with old cows that have been hand-milked. Some consider it a fault that the machines do not milk the cows dry. It is more likely to be beneficial than otherwise that cows must be stripped by hand, for in doing so the udder is subjected to massaging which increases the circulation and maintains the udder at its full productive capacity.

Cleaning the Machine.

As soon as milking is completed the teat cups should be turned into a bucket of cold or tepid water and about a gallon of this drawn through each set to wash out the milk. This should always be done before the milk has had time to dry. Leave them in soak until convenient to finish cleaning; then take to pieces and with hot water and soda brush out all tubes, cups, &c., and then sterilize by boiling in water in which soda has been dissolved at the rate of half a pound to each 10 gallons of water. While not in use or between milkings, keep the cups soaking in limewater. If put away for any length of time the rubbers should be put in a box and covered with French chalk. Never leave rubbers attached to metal or they may stick and tear. Grease is a most destructive agent when left in contact with rubber, and gradually dissolves it. For this reason the parts must be so cleaned that all grease is removed. Great care must be taken to properly clean all the pipes in the releaser plants, otherwise the milk will be contaminated. Good disinfectants for use as well as limewater are weak solutions of formalin or Condy's crystals.

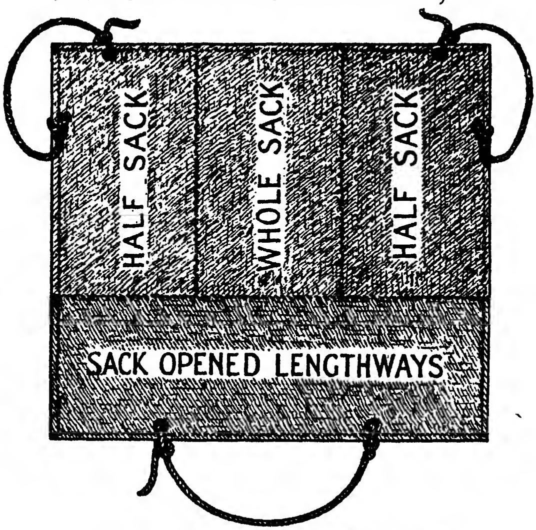
Shade and Shelter.

The production of milk is very largely controlled by nervous action, so for best results the nervous system must be carefully ministered to. Anything that upsets the nervous system will tend to lessen the secretion of milk. For this reason, the comfort of the cow must receive due attention. She must be protected from extremes of heat and cold. A study of the feeding question will explain the necessity for protection from cold. Anything that causes discomfort or irritation will tend to reduce the quantity of milk secreted. To protect cattle against the heat of the summer sun, it is necessary to plant trees in clumps or belts. This will also afford shelter from strong cold winds and rain and provide dry ground for them to lie upon, and thus reduce the risk of mammitis due to getting cold in the udder.

The kind of tree to plant will depend largely upon locality and climate. The climatic conditions of the western plains have been considerably improved by planting belts of sugar gums, which have grown up in a few years, making splendid breakwinds and at the same time providing firewood. Pinus insignis is a very useful tree to grow, as it thrives under almost any conditions, and there is a growing demand for the timber when the times comes for thinning.

Where there is abundance of straw, shelter sheds may prove more convenient. Posts may be erected to bear cross beams and the straw stacked on top. Such a shelter will be found warm in winter and cool in summer. At the Central Research Farm, Werribee, there is a very fine shelter shed built of bails of straw. This would last for many years.

In cold weather cows should be rugged, and they can then graze in comfort. This is a great consideration in winter where cattle are grazed on crops such as Algerian oats, &c. A very satisfactory rug may be made from three wheatsacks—a whole sack to lie from the tail to the withers; half an open sack stitched along each side and another opened lengthwise stitched across the front to lie over withers and shoulders. A cord should be tied across the brisket, and another fairly



Cattle rug made from three wheat sacks.

low down on each thigh to pass under the thigh and through a hole in the rug about the middle of the flank. The ends of these ropes may be fastened to a peg. Another rope for surcingle will complete a very satisfactory rug.

Water.

A plentiful supply of water, clean as possible and easy of access, should be provided. A running stream is an ideal supply. The bore and windmill pump is a very good substitute, when it is possible to find water. Failing these a dam has to be provided, and it should be fenced round to prevent the animals getting into and polluting the water. For good results the cows should drink plenty of water, and this they will not do if it is dirty.

The Home Separator.

When the butter industry was first started in this State practically all the milk was delivered at the factory or at separating depôts. These

sprung up nearly all over Victoria, and were the salvation of the farmers, for at that time, 1889, nearly everything produced on the farm was either unsaleable or at such a low price as to be unprofitable.

The butter exported to London brought such prices as to be highly profitable, and the prosperity brought about by this means soon enabled the State to recover its financial stability. Consequently prices for all classes of produce improved. The industry was new, and the suppliers to the various factories were anxious to make it a success, so they did all they could to deliver the milk or cream to the factory in such a condition that the best possible product could be manufactured. The result was that Victorian butter soon became noted for its high quality. This it retained for many years, until the general spread of the home separator. The principle and construction of the home separator is practically identical with that used in the factory or creamery, the difference being that of size.

Theoretically the home separator should be the means of producing butter of better quality than the factory separator, because, no matter how careful a man is in milking, a certain amount of dirt will find its way into the milk, and the sooner it is removed the better the product should be. The separator is to a great extent a purifier, as all the solid dirt that is in the milk is removed by centrifugal force, and with it a lot of the bacteria that have developed in the milk since it was taken from the cow. As the milk is separated twice daily immediately after milking, it will be easy to see that this must have a very beneficial effect on the cream. In the case of milk separated at the factory, the night's milk is retained in cans and delivered to the factory along with that of the morning; thus there will have been considerable bacterial development overnight.

The milk must be delivered to the factory in a sweet condition, or it would not go through the separator, and the farmer would have to take it home again and feed it to pigs, thereby suffering considerable loss. This compels the supplier to take proper care of the milk by cooling it at night and keeping it in clean utensils. The result is that the manager of the factory has the cream under his control while it is sweet, and is enabled to ripen it properly and churn it when it is just at the correct stage to give the best results, or, in other words, to produce practically all superfine butter. Now, there is no earthly reason why cream from the home separator should not give the same satisfactory results. It all depends upon the care bestowed on the cream.

Milk from the healthy udder of the cow is practically sterile. That is, it is free from germ life, and if milked directly into a sterile bottle and securely corked without being exposed to the air would keep for any length of time practically without change. In practice, however, the milk as it leaves the teat becomes innoculated with various kinds of micro-organisms, depending upon the surrounding conditions. These bacteria, for our purpose, may be divided into two classes—those that are beneficial and those that are detrimental to the production of a first-class article or to the health of the cow. They are of great variety and are everywhere. They are so small that they can be seen only by the aid of a powerful microscope. Every hair, particle of

dust, or scurf off a cow's skin are laden with great numbers of them, so they are falling into the milk all the time it is exposed.

Under favorable conditions they increase and multiply very rapidly. They develop in various ways, some by splitting in two about every half hour, and each half developing into an independent organism, in turn to divide in the same way, so that in twenty-four hours one organism may develop into many millions. Some develop by the production of spores or seeds, and these are the most troublesome to control and destroy. These bacteria increase most rapidly at about the temperature of the animal's body. Milk provides them with food and conditions ideal for their development. This is retarded as the temperature is lowered or raised from the normal temperature of the body. The lower it is reduced the slower the development until when below freezing they practically lie dormant. On the other hand, when the temperature is raised to 140 degrees Fahr. or so, the living bacteria are destroyed. Not so the spores, however. These will withstand great heat, higher than boiling temperature owing to a protective covering. High temperature will destroy the live bacteria, and as soon as the temperature falls to the vicinity of 100 degrees Fahr., the spores or seeds hatch out, develop, and multiply, re-inoculating the milk with bacteria of the most destructive order. What happens when utensils are not properly washed is that hot water will destroy all the organisms which produce a good flavour in butter or cheese, but leave the spores to hatch out as soon as a fresh lot of milk is put into the vessels. If, however, when washing the utensils with hot water a little washing soda be added the spores will be destroyed and the vessels will be cleansed.

Under the Dairy Produce Act, milk or cream must be paid for according to quality, and the dairyman only has himself to blame if he does not receive top price for his product. Although, as before stated, bacteria are everywhere, if proper precautions are taken, those that find access to milk or cream will be those that are desirable and produce good flavours. Those that are responsible for bad flavours are generally directly connected with dirt, so that if one be methodical in his care of the dairy premises and utensils he should be able to deliver milk or cream to the factory in the best possible condition.

To enable this result to be achieved, care must commence where the animals graze or are fed. As stated elsewhere, the water supply must be pure and wholesome. Some of the worst bacteria from a dairyman's point of view are those directly connected with the animal's manure, known as the colon group, the name being derived from its natural home or habitat, *i.e.*, the colon or large intestine of the animal. When these bacteria obtain access to milk they produce gas and putrefactive taints. If a cheesemaker sees pinholey curd, he knows that his milk has been contaminated with this class of bacteria. All possible precautions to prevent this contamination must be taken. The water supply has been found a very frequent source of such contamination. If cows are allowed to walk into a dam to drink, for instance, their droppings become mixed with the mud and earth thereabouts and so reach their udders. This dries, and while the cow is being milked, is falling all the time in the form of dust rickly laden with these colon bacteria, which, immediately they get into the milk, begin to multiply very

rapidly, as the conditions with regard to temperature and food are ideal. Milk provides the most suitable food for bacteria of almost all kinds.

The approaches to the sheds and yards must be kept as clean as practicable, especially in the summer time. Cow-dung must not be allowed to accumulate about the dairy premises, as the movement of the animals and the wind stir up the dry dusty particles, which settle in the milk and utensils. Flies are a very frequent source of contamination. The writer has frequently seen the surface of the milk in a cheese vat literally black with flies. These flies have six legs, at the bottom of each of which is a sucker. The breeding-ground and favorite resting-place of these flies are heaps of manure. A sucker full of this they carry away with them and deposit in the milk. For this reason, manure should be regularly cleaned away from yards and sheds, and put on the land, where it is required in unlimited quantity. The regular lime-washing of cow-sheds helps very materially to keep the fly pest in check.

Before commencing to milk, no matter whether the weather is wet or fine, the cows' udders must be cleansed. If very dirty, it will be necessary to wash them thoroughly. In fine weather, wipe over with a damp cloth rung out of clean water. If an arrangement such as that shown on page 711, consisting of a 10-gallon oil drum with a tap in the bottom, be used, a bit of lime may be placed in the drum, and the resulting limewater will help to keep the cloth, &c., clean and sweet. Limewater is a very good germicide.

Care of the Separator.

The separator should be kept free from dust. Small particles of sand getting into the bearings will cause them to become hot when working, with the result that those parts get rough and worn, and the machine runs unsteadily. This will mean expense for the renewal of the worn parts; in addition, the skimming will be imperfect, and a serious loss of butter-fat will take place.

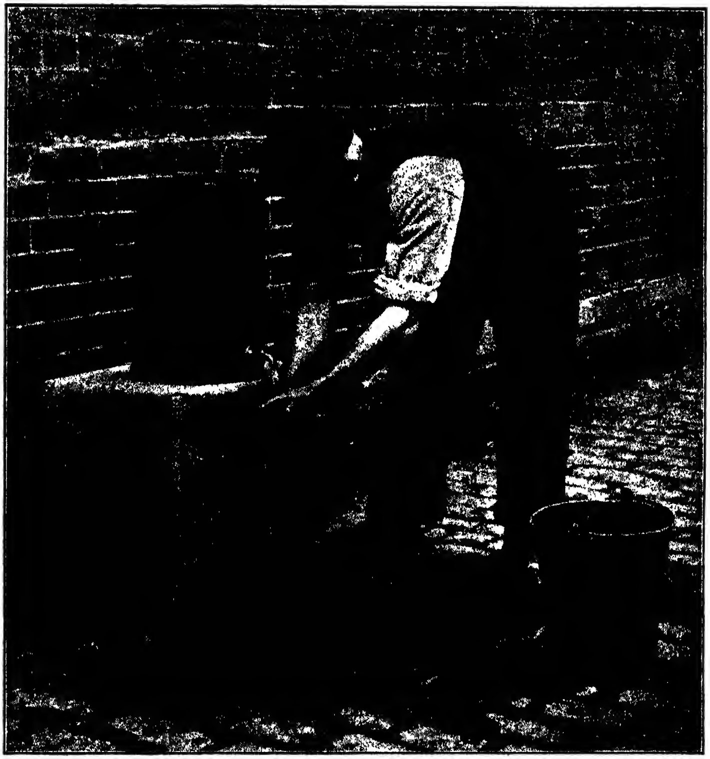
Only oil of good quality should be used. The use of cheap or inferior oils produces the same effect as the presence of grit on the bearings, and consequently shortens the life of the machine, impairs the efficiency of the work done, and adds considerably to the cost of repairs. Keep all working parts free from dust and well oiled. Do not use a brake of any sort to stop the machine—allow it to run down. An oilcloth or canvas cover will greatly help to keep the dust from the machine when it is out of use, and will well repay any cost and trouble involved.

The separator should be placed in a clean room properly constructed with an impervious floor with a fall to a drain, so that it can easily be washed. Plenty of light and ventilation must be provided, and fly-wire used where necessary to prevent flies having access to the interior.

The machine must be set on a firm foundation to prevent vibration. The best foundation is a concrete pier with bolt embedded, to which is attached 4-in. x 4-in. hardwood, on which the separator may be bolted. A solid wooden block will make a good substitute. Care must be taken to set the machine level.

CLEANING THE SEPARATOR.

On many dairy farms, neglect to properly clean the separator results in the delivery to the factory of inferior cream. We have already seen that milk originally is pure and clean, but through want of proper care it may become contaminated. A very frequent source of contamination is a dirty separator. Much harm has been done in bringing about this result by the instruction of unscrupulous selling agents, who



A handy device for the milking shed.

have led buyers to believe that it is not necessary to wash the separator each time it is used. The separator acts as a purifier. All the solid dirt is collected in the slime, together with a large number of the bacteria present. The bulk of the slime is casein, a constituent of the milk, which coagulates when it becomes sour. This is ideal food for the development of taint-producing bacteria, and if the machine is not properly cleaned after it is used, it will be in a vile condition by the time the next lot of milk is put through, with the result that irreparable damage is done to the cream.

The bowl should be thoroughly cleaned as soon as possible after separating is finished. First rinse the milk off with cold or tepid water; then thoroughly brush every part, using the proper brushes for this purpose. Never use sand, ashes, a wire brush, or anything that will scratch the tin off. Hot water and soda are the best cleansing agents. Beware of dirty cloths.

Cooling cream or milk.

It has been found, in cases where the separator was washed only once a day, that the loss in butter-fat in the skim milk was three times as great as when it was properly cleaned.

Cooling the Milk or Cream.

It is recognised that in practice it is quite impossible to prevent all forms of bacteria getting into the milk, but when due precautions are observed, only those that are in the air will find their way to the milk or cream; these are of the lactic-acid-producing group, and are beneficial in that they produce good flavour in the manufactured product. They, however, must be controlled, or they will develop too rapidly, so that the milk will be too sour for cheese-making.

In the case of cream, when a certain amount of acidity has been produced, it will act as a toxin or poison to the lactic bacteria which lie dormant, and cheesy, rancid, bitter, and other flavours are developed.

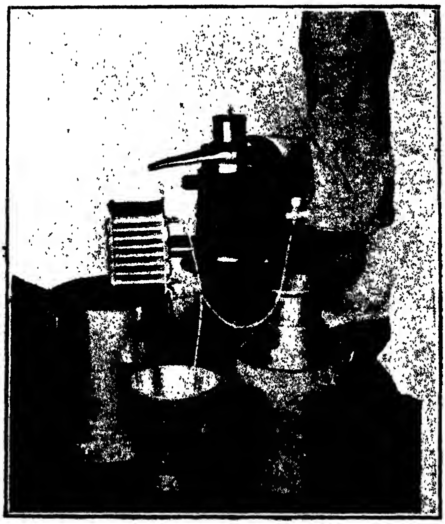
While we cannot help a certain amount of innoculation, we must take the necessary steps to keep it in check. The only practical way to do this is to reduce the temperature of the milk or cream immediately after milking or separating. There are various appliances on the market that will enable this to be done. A supply of water must be

Cooling cream as it flows from the separator.

provided for this purpose. In some districts bore water is available, and this is ideal, as it is always sufficiently low to reduce the temperature of the milk or cream to the vicinity of 60 degrees Fahr. In the absence of bore water, underground tanks should be provided. The water used for cooling may be run back into the tank. In some cases, a large water-bag has been found satisfactory. After being cooled, care should be taken to keep the cream cool until it can be sent to the factory. In hot weather, it may be necessary to wrap wet bags round the can.

A very satisfactory arrangement for keeping the cream cool is what is known as the Coolgardie safe. This consists of a framework covered with hession. On top is a vessel holding water, from which strips of material hanging over the side siphon the water out and allow it to trickle over and saturate the hessian. By the evaporation which takes place, the safe is kept cool.

If milk is intended for cheese-making or city supply, it should be run over a cooler of the Laurence pattern as soon as possible after it is drawn from the cow. This drives off the animal heat and odour, and, by reducing the temperature, insures that it will be in good condition when it is delivered. The flavour of the milk thus treated is completely changed, being much sweeter and richer to the taste.



Another separator and cream cooler attachment.

Care of the Cream.

Immediately the cream is separated, it should be run over a cooler and reduced to as low a temperature as possible. There are various makes suitable that may be fixed so that the cream runs over them as it leaves the spout of the separator and straight into the can. Warm fresh cream should never be mixed with cold cream; the fresh must always be cooled before being mixed with the other. When a fresh lot is added to the can, it must be mixed by stirring. The can of cream must be kept cool, and covered with muslin or fine wire gauze to keep out flies and dust.

To obtain the best results, the cream should be delivered to the factory daily, when it should be in such a condition that the factory manager will be able to make choicest butter from it. The longer the cream is kept, the greater the liability to deterioration. As every

supplier is paid for the cream according to its quality, it is to his interest to deliver it as early and in as good condition as possible.

Variations of Test.

Many farmers do not understand the variation in the test of the cream. They think that because, so far as they can tell, the conditions under which the cream is produced are the same from day to day, there should be no variation. The fact is that, should the returns from the factory show no change from week to week, it is indicative that there is something wrong with the testing. Variations are bound to occur that are entirely due to conditions under which the milk is separated. They are to be accounted for by:—1. Smooth running; 2. Speed; 3. Cleaning of the separator; 4. Rate of inflow; 5. Temperature of the milk; 6. Condition of the milk; 7. Richness of the cream; 8. Richness of the milk separated; 9. Amount of water or skim milk used in flushing the bowl.

Smooth Running.—When the machine runs smoothly, the cream is separated from the skim milk, and they find their way to their respective outlets. If there be any vibration, the milk and cream are not properly separated, but become shaken together.

Speed.—Instructions are given with every machine as to the speed at which it should run to obtain the best results. Turning at too high a speed will do no harm, unless such a high rate is attained that the strain is too great for the bowl, and it may burst. The figures given below illustrate what to expect if the speed is varied from that at which the machine should be run:—

AVERAGE PER CENT. OF BUTTER-FAT LOST IN SKIM MILK AT DIFFERENT SPEEDS.

Turns of crank per minute.	Test.
10 too high	.029 per cent.
Normal	.029 per cent.
10 too low	.120 per cent.
20 too low	.210 per cent.

Rate of Inflow.—Each machine is rated to a certain capacity, and must not be overfed. It is necessary, however, to reduce the feed at certain times. For instance, generally in the autumn, the milk is richer and more viscous, and then the rate of inflow should be reduced a little. If the skim milk is tested regularly, the best rate of feed will be ascertained.

Temperature of the Milk.—Warm milk separates more easily than cold, because it is less viscous or syrupy. As it comes from the cow it is in the best condition, being sweet, and over 90 degrees Fahr. It is doubtful if any machine will do good work if the temperature of the milk is below 80 degrees Fahr. The following figures give the loss of butter-fat in skim milk when separated at different temperatures:—

Temperature of Milk.	Loss in Butter-fat.
90 degrees F.	.022 per cent.
75 degrees F.	.051 per cent.
60 degrees F.	.120 per cent.

Richness of the Cream is regulated by the cream screw. While many other factors may affect the test of the cream, the cream screw is depended upon to regulate the percentage of fat. The screw should

be operated so that the test of the cream will be between 40 and 50 per cent. If it is too low, there is too much milk left in, and the cream will go sour more quickly. If it is too high, there may be increased loss in the skim milk, and it is difficult to tin and keep it in good condition.

Richness of the Milk will affect the test, but not the quantity of the cream.

Flushing the Bowl.—The variation in the amount of water or skim milk used in flushing the bowl may cause the test to vary from 2 to 5 per cent., according to the amount of cream.

Feeding for Milk Production.

The cow has been compared to an engine, with the great difference that the cow is a live machine while the engine is lifeless. In the latter, provided the machinery is well cared for and properly lubricated, there is very little wear and tear; but with the cow, there is continual waste of tissue. We feed fuel to a boiler in the form of wood, coal, or oil in order to boil water, and if we stopped as soon as the water boiled, we might as well have burnt the fuel in the open air for any return we would get for it. If we apply more fuel, however, a pressure of steam will be generated, and it is from the additional fuel fed that we get our return.

The same principle applies to the cow. In full milk, she should be given about one-tenth of her body weight per day of a mixture equal to grasses and clovers when in full bloom, *i.e.*, a cow 1,000 lbs. in weight giving 3 gallons of average quality milk, requires 100 lbs. of food per day. This mixture should consist of about 75 lbs. of water and 25 lbs. of dry matter.

The dry matter should be made up of 10 lbs. indigestible fibre, and 15 lbs. of digestible or soluble material; and the soluble matter should contain 12 lbs. carbo-hydrates, 2½ lbs. protein, and ½ lb. fat. This represents a balanced ration, *i.e.*, the different ingredients are in the proportion that the cow can make use of.

Carbo-hydrates, so called because they are composed of carbon and water, and represented in the food by sugar, starch, and gum, are heat and energy producing foods.

Fat or Oil are used for the same purpose, but 1 lb. of fat is equal to 2¼ lbs. of sugar or starch.

Protein is the most important part of the food. In addition to carbon and water, it contains nitrogen, phosphorus, sulphur, lime, &c. From this the whole of the cell system of the body is built up, waste of tissue repaired, and the cell system of the udder replenished. The secret of milk production lies in the provision of a plentiful supply of protein.

Balancing the ration means mixing the foods so that the different constituents are in the proportions which can be most economically made use of by the cow. For instance, 100 lbs. of green lucerne contains 3.7 lbs. of protein. That is 1¼ lbs. more protein than a cow can make use of; but 164 lbs. would be required to yield the 12 lbs. of carbo-hydrates, and this would increase the loss of protein to 3½ lbs. Again, with green maize, containing 1 per cent. protein, a cow would require 250 lbs. to get the required amount of protein; but 100 lbs. of green

maize contains the right amount of carbo-hydrates. Consequently, if 250 lbs. of this food is consumed, 17½ lbs. of carbo-hydrates go to waste; or, in other words, for every ton of green maize the cow eats, 1½ tons will go to waste, passing through the system unused.

As it is a physical impossibility for a cow to eat much more than 100 lbs. of green maize a day, she cannot, if fed on maize alone, eat enough to provide her with the requisite amount of protein to keep up her milk flow. On lucerne, she would give her full milk supply, for protein would take the place of carbo-hydrates—the nitrogen, phosphorus, sulphur, lime, &c., passing through the system wasted. This would be an extravagant way of feeding, for in practice it is found that the most expensive constituent of food to provide is protein. By mixing the green maize and lucerne together the ration is balanced. The excess of protein in the lucerne makes up the deficiency in the maize, and the plentiful supply of carbo-hydrates in the maize meets the deficiency in the lucerne.

The quantities specified above apply to the average cow giving an average amount of milk, but they will require to be varied to suit circumstances.

The average composition of milk is as follows:—

Per cent. Fat.	Per cent. Protein.	Per cent. Carbo-hydrates.
3	2.8	4.5
4	3.2	4.9
5	3.6	5.0
6	4.0	4.9

It will be seen that, as milk increases in butter-fat, it increases in protein; that it increases in carbo-hydrates up to 5 per cent. fat, and then there is a slight decrease in milk testing higher than 5 per cent. fat.

A cow giving a greater amount of rich milk will require an increased amount of protein, &c., from which to manufacture that milk.

Careful investigation, extending over many years, has given the necessary data on which to work. It is found that for maintenance, *i.e.*, for heat, energy, renewal of waste of tissue, &c., the cow requires for every 100 lbs. live weight .07 lb. protein, .7 lb. carbo-hydrates, .01 lb. fat. So a 1,000-lb. cow requires .7 lb. protein, 7.0 lbs. carbo-hydrates, .1 lb. fat. Then for each pound of milk of a given per cent. of fat the following nutrients are required:—

For Milk Testing. Per cent. of Fat.	Protein. lbs.	Carbo-hydrates. lbs.	Fat. lbs.
3	.042	.19	.013
3.5	.045	.21	.015
4.0	.048	.23	.016
4.5	.051	.25	.018
5.0	.054	.27	.019
5.5	.057	.29	.020
6.0	.060	.31	.022

Therefore a cow giving 30 lbs. of 4 per cent. milk per day would require for milk-producing purposes 30 times the nutrients specified in the third line of the above table; or —

	Protein. lbs.	Carbo-hydrates. lbs.	Fat. lbs.
For milk production	1.44	6.9	.48
For maintenance	.70	7.0	.10
A total of	2.14	13.9	.58

A cow giving 50 lbs. of 5 per cent. milk per day would require—

	Protein. lbs.	Carbo-hydrates. lbs.	Fat. lbs.
For milk production ..	2.7	13.5	.95
For maintenance ..	.7	7.0	.10
A total of ..	3.4	20.5	1.05

Balancing the Ration

To make up a balanced ration, proceed as follows:—Suppose a cow weighs 1,200 lbs., and gives 40 lbs. of 5 per cent. milk. The table shows that for maintenance she would require for each 100 lbs. live weight, .07 lb. protein, .7 lb. carbo-hydrates, and .01 lb. of fat. These figures, multiplied by twelve, give the required amount for maintenance, viz.:—.84 lb. protein, 8.4 lbs. carbo-hydrates, .12 lb. fat; and for each pound of milk testing 5 per cent. of fat, .054 lb. protein; .27 lb. carbo-hydrate, .019 lb. fat. Multiply these figures by 50, and the required amount of nutrients for milk production is shown, viz.:—

	Protein. lbs.	Carbo-hydrates. lbs.	Fat. lbs.
Total for milk ..	2.7	13.5	.95
Total for maintenance ..	.84	8.4	.12
Total required ..	3.54	21.9	1.07

Making up the Ration.

	Feed. lbs.	Protein. lbs.	Carbo-hydrates. lbs.	Fat. lbs.
Oat hay chaff ..	20	.900	8.74	.30
Linseed meal ..	2	.522	.77	.13
Wheat bran ..	6	.672	2.53	.15
Polly feed ..	3	.420	1.56	.06
Crushed wheat ..	4	.548	1.90	.056
Maize silage ..	30	.540	4.05	.18
		3.602	19.55	.87

This ration allows plenty of protein, but is somewhat deficient in carbo-hydrates. This may be rectified by the addition of a few pounds of molasses.

Then take a cow grazing on green oats:—

	Protein. lbs.	Carbo-hydrates. lbs.	Fat. lbs.
110 lbs. gives	2.86	21.79	1.10
Add 5 lbs. lucerne hay chaff	.61	1.85	.08
	3.47	23.64	1.18

If she is grazing on grass, she will require the addition of a few pounds of food rich in protein to enable her to keep up the big flow of rich milk.

In the above ration, it will be noticed that the roughage, *i.e.*, oaten hay chaff, contains practically sufficient of the various nutrients for maintenance, and therefore the concentrates are required for milk production.

There is no need for a farmer to work out the actual ration, as, after years of investigation, it has been found satisfactory in practice to allow 1 lb. of concentrates for every 3 lbs. of milk the cow is giving, if

it is rich milk; and 1 lb. for every 4 lbs. if it is average quality, in addition to as much roughage as she will eat.

Danish System of Food Standards.

The Danes have done an immense amount of experimental work in connexion with feeding, and have worked out a system of food standards. Their standard unit is 1 lb. of concentrated feed, *i.e.*, cereals, mill offal, oil meal, &c.—

$2\frac{1}{2}$ to 3 lbs. of good meadow hay equals one standard.
4 lbs. of poorer hay equals one standard.
10 lbs. of swedes equals one standard.
12 lbs. of white turnips equals one standard.
4 lbs. of potatoes equals one standard.
10 lbs. of green fodder equals one standard.
6 lbs. of buttermilk equals one standard.
6 lbs. of skim milk equals one standard.
12 lbs. of whey equals one standard.
1 lb. of new milk equals one standard.

For maintenance, one standard is required for every 150 lbs. live weight, and for milk production one standard for each 1 lb. of milk. The above system has been very largely adopted, both in England and America, and found to work satisfactorily. It is, moreover, simple in application.

Comparative Values of Stock Foods.

To ascertain which are the most economical foods to purchase, the following method of estimating the comparative values of stock foods is approved by leading authorities on the subject. It is estimated on the unit value, which is calculated as under:—

Percentage of protein plus fat multiplied by $2\frac{1}{2}$ plus carbo-hydrates divided into market price.

Example—

Linseed Cake (Meggitt's Meal, Etc.).

Protein	.. 26·1%	$\left.\right\}$ = 32·6 × $2\frac{1}{2}$ =	81·5
Fat	.. 6·5%		
C.H.	.. 38·5%	.. ..	38·5
			120·0 food units £11 = 1s. 10d. per unit

Bran.

Protein	.. 11·2%	= 13·7 × $2\frac{1}{2}$ =	34·25
Fat	.. 2·5%		
C.H.	.. 42·2%	.. ..	42·2
			76·45 food units £5 = 1s. $3\frac{1}{2}$d. per unit.

Oaten Hay.

Protein	.. 4·5%	= 6·0 × $2\frac{1}{2}$ =	15·0
Fat	.. 1·5%		
C.H.	.. 43·7%	.. ..	43·7
			58·7 food units £2 10s. = $10\frac{1}{4}$d. per unit

Lucerne Hay.

Protein	.. 12·3%	= 13·9 × $2\frac{1}{2}$ =	34·75
Fat	.. 1·6%		
C.H.	.. 37·1%	.. ..	37·1
			71·85 food units £5 = 1s. $4\frac{1}{2}$d. per unit

Comparative Value of Foods.

Grain.

	Digestible Nutriments.			Food Units.	Worth when Bran is 1s. per bushel, £5 per ton.
—	Protein.	Fat.	Carbo-hydrates.		
	per cent.	per cent.	per cent.		per bushel.
					£ s. d.
Peas	19·4	1·0	49·9	101·0	0 4 0
Beans . .	22·1	1·2	44·1	102·3	0 4 0
Wheat	13·7	1·4	47·6	85·3	0 3 4
Barley . ..	9·6	2·1	63·5	92·7	0 3 0
Maize . ..	7·8	4·3	66·7	96·9	0 3 8
Oats	9·2	4·2	47·3	80·8	0 2 1
Millett . .	8·0	3·1	45·8	73·5	0 2 11
Rye	9·6	1·1	63·9	90·6	0 3 6
					per lb.
Linseed	19·4	34·7	18·0	155·2	0 0 1¼

Products.

					per 2,000 lbs.
Bran	11·2	2·5	42·2	76·4	5 0 0
Pollard	12·2	3·8	53·4	93·4	6 2 0
					per 2,240 lbs.
Linseed cake	26·1	6·5	38·5	120·0	8 16 0
Coconut oil cake ..	16·4	9·1	42·2	106·0	7 15 0
Dried blood	52·3	2·5	0·0	137·0	10 0 0
Maize oil meal ..	18·7	20·9	27·1	126·0	9 4 0
Polly feed	14·0	2·0	52·0	92·0	6 14 0
Mollerne	11·3	2·9	47·0	82·0	6 0 0
Corn and cob meal ..	8·4	2·0	7·2	96·2	7 0 0
Malt combings ..	14·9	7·9	51·8	109·0	7 19 0
Oat branning	9·6	5·5	54·1	91·8	6 14 0
Rice meal	11·8	13·3	48·4	111·1	8 2 0
Oat hulls	1·6	0·6	49·4	55·0	4 0 0
Molasses	..	..	62·0	62·0	4 10 0
Pea refuse	17·4	1·5	53·1	100·3	7 7 0
Cocoa husk meal ..	0·6	5·2	22·3	36·8	2 13 0
Brewers' grains, wet ..	3·9	1·4	9·3	22·5	1 13 0
Brewers' grains, dry ..	20·0	5·7	38·0	102·2	7 9 0

COMPARATIVE VALUE OF FOODS—*continued.*

GREEN FODDER.

—	Digestible Nutrients. Protein.	Fat.	Carbo-hydrates.	Food Units.	Value per ton.
	per cent.	per cent.	per cent.		£ s. d.
Barley	1·9	0·4	10·2	15·9	1 3 0
Cocksfoot grass	1·5	0·5	11·4	16·4	1 4 0
Clover (red)	2·9	0·7	14·8	23·8	1 14 0
Lucerne	3·7	0·6	7·3	18·0	1 6 0
Maize	1·0	0·4	11·6	15·1	1 2 0
Oats	2·6	1·0	18·9	27·9	2 0 0
Rye	2·1	0·4	14·1	20·3	1 9 0
Sorghum	0·6	0·4	12·2	14·7	1 1 0
Vetch	3·9	0·5	7·3	18·3	1 6 0
Rape	1·0	0·2	7·2	10·2	0 14 0

ROOTS.

—	Protein.	Fat.	Carbo-hydrates.	Food Units.	Value per ton.
Mangels	1·1	0·1	5·4	8·4	0 12 0
Maize silage	1·8	0·6	13·5	19·5	1 8 0
Pumpkins	1·0	0·3	5·8	9·0	0 12 6
Sugar beet	0·9	..	20·3	22·6	1 13 0
Beet slices	0·3	..	4·0	4·75	0 7 0
Swedes	1·0	0·2	7·2	10·2	0 14 6
Cabbage	1·8	0·4	8·2	13·7	0 19 6
Carrots	0·8	0·2	7·8	10·5	0 15 0
Potatoes	0·9	0·1	16·3	18·8	1 6 10

HAY.

—	Digestible Nutrients. Protein.	Fat.	Carbo-hydrates.	Food Units.	Value per ton when Oaten Hay is £4 6s.
	per cent.	per cent.	per cent.		£ s. d.
Oaten	4·5	1·5	43·7	58·7	..
Lucerne	12·3	1·6	37·0	72·0	5 5 0
Wheaten	3·5	1·2	34·2	45·9	3 7 0
Grass (good)	6·1	1·2	37·8	56·0	4 2 0
Vetch	12·9	1·4	37·5	73·2	5 6 0
Clover	6·8	1·7	35·8	57·0	4 3 0

STRAW.

—	Protein.	Fat.	Carbo-hydrates.	Food Units.	Value per ton.
Oat	1·2	0·8	38·6	43·6	3 3 0
Barley	0·7	0·6	41·2	44·4	3 4 0
Wheat	0·4	0·4	36·3	38·3	2 14 0
Pea	4·3	0·8	32·3	45·0	3 5 0

THE PIG.

Until recently, the pig has been the means of obtaining the highest returns for the by-products of the dairy, *viz.*, skim milk, buttermilk, and whey. The war, however, gave an impetus to the development of industries which give a better return for the by-products. The demand for casein has increased to such an extent that many factories are now extracting all they can from the separated milk, leaving only whey for feeding to pigs. All the same, there are many districts yet where separator milk and whey will for a long time be converted into pork.

The pig industry has been fully dealt with in Bulletin 16, and there is no need to repeat any portion of it here. It may be stated, however, that it is quite easy to calculate whether the conversion of the by-products of milk into pork will be more profitable than to let the factory have them for the manufacture into casein, dried milk, milk sugar, &c.

Thirty pounds of separated milk will produce 1 lb. of pork. So if pork is bringing 6d. per lb., 1 gallon of skim milk will be worth 2d. per gallon, or if we deduct ½d. for working expenses, 1.83d. per gallon. Buttermilk is equal to skim milk if no water be added; but, of course, the addition of water reduces its value to the extent of amount of water added. Whey, although it looks so watery, is worth just half as much as skim when fed to pigs; but, as shown in the above-mentioned bulletin, they must be mixed with grain or mill offal to give satisfactory results.

THE BUTTER-FAT TEST.

CAN IT BE INCREASED?

Mr. H. G. van Pelt, one of the world's foremost dairy enthusiasts, when asked "Can a cow's butter-fat be increased?" told his inquirer that every cow has a maximum butter-fat test gained by heredity. She can be so fed and cared for that she will produce milk for that test, but she cannot regularly stimulate unerringly such a maximum test without deviation; but the knowledge available does not permit of this as yet. It is well known that a well-balanced ration which provides all of the essentials in abundance for maintaining the body of the cow and providing for her largest butter-fat production is conducive to securing the best possible percentage test and the largest possible milk flow. It is also known beyond dispute that comfortable conditions favour a high test, and, on the other hand, all factors that detract from the comfort of a cow detract from the butter-fat percentage. No doubt that is the reason why cows test lower in mid-summer, when the heat is intense and flies pesky, than during the other months of the year.

STANDARD HERD TEST.

REPORT FOR QUARTER ENDED 30th SEPTEMBER, 1922.

The cows which finished during the quarter number 450, of which 332 qualified for the certificate. Individual returns are as follow:—

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No	Date of Calving.	Days in Test.	Milk last Day of Test	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs
								lbs	lbs.		lbs	lbs	lbs.	
Mrs. F. M. Akehurst, Tunstall	1	Nil	Jersey											
The Alston Estate, Cobram	6	5	Jersey ..	Annie G. of Tarnpirr .	6022	21.10.21	273	11	5,889	5·75	338·84	250	386¼	284
				Regina of Tarnpirr .. .	Not yet allotted.	24.10.21	273	12½	5,440	6·18	336·14	200	383¼	253
				Idyll's Ideal	2098	1.11.21	273	12½	5,945	4·84	287·48	250	327¾	269, 340, 335, 284
				Sunflower of Tarnpirr ..	Not yet allotted.	14.11.21	273	13½	4,105	5·25	215·49	175	245¾	
				Belladonna of Aberdour .	Not yet allotted.	22.11.21	273	17½	4,457	5·20	231·82	175	264¼	
J. Anderson, junr., Lyndhurst	2	2	Jersey .	Linda 52nd of Kingsvale .	9,177	26.10.21	273	20½	6,249	5·84	364·91	175	416	
				Canary 12th of Kingsvale ..	Not yet allotted.	25.12.21	273	28½	7,582	5·33	404·17	..	460¾	
L. F. Armstrong, Hesket, near Woodend	1	1	Ayrshire	Bertha 2nd of Ellerslie ..	Not yet allotted	11.11.21	273	15½	5,932	4·21	249·52	175	284½	
W. H. Atherton, Murray Vale, near Swan Hill	3	3	Jersey ..	Quality of Meadowvale ..	..	2.10.21	273	16	5.129	5·71	293·12	175	334¼	
				Tiny of Meadowvale ..	..	4.10.21	273	17½	5,883	6·35	373·59	175	426	
				Rarity of Meadowvale ..	..	20.11.21	273	14	5,263	6·28	330·52	175	376¾	
W. K. Atkinson, Swan Hill	4	4	Shorthorn	Cherry of Willow Park ..	9198	28.9.21	273	30	12,017	3·94	474·06	200	540½	325
				Princess of Willow Park ..	Not yet allotted	29.9.21	273	22½	7,054	3·63	256·10	175	292	
				Blush of Willow Park ..	"	6.10.21	2 73	25	8,144	3·93	320·02	175	364¾	
				Cherry 5th	10893	27.11.21	273	12½	7,608	3·73	284·02	250	323¾	235, 218, 269, 343

CERTIFICATED COWS—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
C. Bamford, Benalla	1	1	Ayrshire	Trixie of Medburn Grove ..	7005	14.10.21	273	11	6,683	5·02	335·54	200	382½	246
A. E. Batson, Buckley, near Winchelsea	5	1	Jersey ..	Lady Marge of Ferndale ..	6368	29.9.21	273	11	5,183	5·44	281·80	250	321¼	278
Mrs. J. Beard, Outtrim	2	2	Jersey ..	Mary Birt of Kelburn ..	Not yet allotted.	14.10.21	273	15½	5,614	5·54	311·13	200	354¾	
				Shadow of Luscombe* ..	6143	1.11.21	273	11	7,266	5·37	390·36	250	445	262, 281, 323
F. W. Beischer, Bendigo	3	2	Jersey ..	Jessemia 13th of King's Vale†	..	29.11.21	246	14½	4,349	5·94	258·30	200	294½	181
				Annette 2nd of King's Vale ..	9203	16.12.21	273	15	5,730	4·91	281·35	250	320¾	304, 305
J. Benallack, Elliminyt, near Colac	4	3	Ayrshire	Phyllis of Woodbyrne ..	6119	25.10.21	273	9½	5,126	4·34	222·46	175	253½	
				Baronia of Woodbyrne ..	4893	25.10.21	273	4	6,465	4·43	286·56	200	326¾	264
				Molly of Woodbyrne ..	6118	1.11.21	273	5½	4,684	3·98	186·19	175	212¼	
F. Bidgood, Staghorn Flat, near Wodonga	3	2	Jersey ..	Butter Queen of Staghorn ..	5591	3.10.21	273	7½	5,851	5·22	305·67	250	348½	193
				Milkmaid of Staghorn ..	9212	29.10.21	273	17½	6,177	5·52	341·26	200	389	229
Mrs. Agnes Black, Noorat	1	Nil	Jersey											
A. A. Broad, Sutton Grange	1	1	Jersey ..	Goldfinch of Fair View ..	7183	30.9.21	272	16	5,118	5·34	273·25	200	311½	
Callery Bros., Bannockburn	7	5	Ayrshire	Snowflake of Rythdale ..	2842	6.10.21	239	4	6,931	3·95	273·40	250	311¾	241, 346
				Pixie of Langley Park ..	8552	15.10.21	273	19	6,371	3·61	229·91	175	262	
				Alma of Langley Park ..	3477	14.10.21	273	10½	7,155	3·75	269·55	250	307¼	290, 326, 350
				Ada of Langley Park ..	8542	14.11.21	273	22	7,147	4·17	297·76	175	339½	
				Madge of Langley Park ..	8547	10.12.21	273	10	4,490	4·24	190·21	175	216¾	

* Entry deferred one week owing to milk fever. † Withdrawn before completion of term.

CERTIFICATED COWS—*continued.*

Owner.	No completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
Dr. S. S. Cameron, Hawthorn	1	1	Friesian	Ashlynn 63	Not yet allotted.	12.10.21	273	9	5,681	3·36	191·15	175	218	
H. D. W. Canobio ..	6	4	Ayrshire	Annetta of View Point ..	4959	10 10 21	262	4	7,146	3·81	272·46	250	310¾	316
				Jessie's Pride of Bundara ..	4263	20 10.21	273	6	8,038	3·66	293·98	250	335¼	355, 295, 383
				Model of Woodstock Grange	4961	2.11.21	273	13	5,639	4 72	266 51	200	303¾	
				Primrose of Wethersdane .	5285	8 11 21	273	12¼	6,600	3 98	262·79	250	299½	
Mrs. M. E. Carroll, Tyntynder Central	2	2	Red Poll	Cambria	430C	9.10.21	270	4	6,220	4 06	252·54	250	288	200, 287
				Scotia	525D	3 11.21	273	10	7,089	3·59	254·28	250	289¼	304, 318, 295, 379
P. Chirnside, Oakleigh	3	3	Jersey ..	Keepsake of Warenda ..	Not yet allotted	12 10 21	273	13	5,593	6·24	348 86	200	397¾	248
				Phyllis 2nd of Warenda .	7195	15 10 21	273	12¼	7,411	5·01	373·46	200	425¼	310
				Graceful Countess 2nd of Lesterfield	Not yet allotted	26.11.21	273	19¼	5,863	6·30	369·45	200	421¼	210
J. W. Cochrane, Moorabbin	10	4	Ayrshire	Rosette of Springfield ..	6242	19 10.21	273	22	6,626	3 99	264·20	175	301¼	
				Ruby of Springfield ..	6243	12.11.21	265*	15	6,778	4·08	276·96	200	315½	243
				Cowslip of Devon Park ..	7863	18 11.21	222*	10	5,919	4·84	286·88	250	327	295
				Ada of Rythdale Park ..	6081	19 12 21	228*	24	7,299	3·91	285·65	250	325¾	
Cockbill and Gibbs, Bamawm Extension	27	9	Ayrshire	Mona of Wethersdane .	9618	27.9.21	273	10	4,934	4·33	213·46	175	243½	
				Blossom of Wethersdane ..	9592	30.9.21	273	7	5,140	3·98	204·33	175	233	
				Tottie of Warrook .. .	8916	2.10.21	252	4	5,087	4·36	221·96	200	253	240
				Snowy 2nd of Mt. View ..	8914	5.10.21	253	4	4,842	3·71	179·54	175	204¾	
				Sunshine of Roxburgh ..	6335	13.10.21	265	4	5,163	4·25	219·61	200	250¼	
				Belle of Wethersdane .	7438	14.10.21	273	9	4,775	3·94	188·32	175	214¾	
				Nannie 2nd of Burnside .	3932	19.10.21	273	10¼	6,607	3·92	259·35	250	295¾	
				Fashion of Warrook ..	5171	1·11·21	244	4	5,684	4·49	255·96	250	291¼	269, 319, 299
				Bardy of Winslade	8212	25.11.21	273	11	5,383	4·45	239·56	175	273	

* Sold before completing term.

Certificated Cows—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
W. J. Colman, Kerang	1	1	Jersey ..	Molly 2nd of Clover Flat ..	5488	24.10.21	273	11	7,312	5·47	400·17	250	456½	
W. T. Cullen, Warrion	13	3	Ayrshire	Olive of Riccarton	6507	26.9.21	273	5	4,493	4·15	186·35	175	212½	
				Boronia of Retreat ..	4321	30·9·21	273	9½	6,558	3·99	261·98	250	298¾	298, 332
				Bessie of Roxburgh ..	7466	11.12.21	273	25½	6,144	4·20	257·74	250	294	
O. Cutler, Longwarry South	1	1	Jersey ..	Bright Stockings of Warenda..	7189	29.9.21	273	11	5,901	5·01	295·84	200	337½	238
R. G. Dent, Moe ..	1	1	Red Poll	Coney .. .. .. Flowing Vale	..	4.10.21	260*	9½	4,396	4·77	208·31	175	237½	
Department of Agriculture, Werribee	7	7	Red Poll	Ontario	399C	28.9.21	273	16	8,807	3·86	340·06	250	387½	200, 323, 304, 249, 362, 315
				Latakia	396C	29.9.21	273	19½	10,797	4·66	504·08	250	574½	351, 390, 463, 460
				Victoria Red Rose	3AA	14.10.21	273	15½	7,437	4·12	306·50	250	349½	346, 284
				Queen Elizabeth	400C	24.10.21	273	23½	9,621	4·44	427·64	250	487½	300
				Pacifica	Not yet allotted.	15.10.21	273	18½	7,427	3·49	259·34	250	295¾	279, 263
				Tonga	253A	19.11.21	273	21	12,306	4·16	512·90	250	584¾	293, 349, 384, 424, 408
				Avesia	287B	18.12.21	273	21	9,833	4·17	410·84	250	468½	280, 335, 309, 440, 304
	1	1	Friesian	Victoria Bellona	Not yet allotted	18.10.21	273	24	6,438	3·69	237·54	175	270¾	
Dickinson Brothers, Sebastopol	2	2	Friesian	Queenie of Ashby	267	2.10.21	273	20½	12,604	3·86	486·95	250	555	296, 440
				Countess 2nd of Ashby ..	328	7.10.21	273	16	8,273	3·58	295·39	200	336¾	217

* Withdrawn before completion of term.

Certificated Cows *continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
T. Douglas, Smythe's-road, Ballarat	7	5	Ayrshire	Greatness of Roxburgh ..	5125	25.9.21	223	4	6,343	4·03	255·69	250	291½	264, 300
				Graceful of Roxburgh ..	9046	21.10.21	226	4	5,114	4·98	254·89	250	290½	264
				Gaiety of Roxburgh ..	6322	20.11.21	268	4	5,512	3·69	203·75	175	232¼	
				Gladsome of Roxburgh ..	6325	4.12.21	205	18	6,570	3·63	238·72	200	272¼	
				Purest of Roxburgh ..	5128	15.12.21	273	8	6,887	4·00	275·64	250	314¼	
C. Falkenberg, Elliminyt	2	Nil	Jersey											
A. W. Findley, Leitchville	3	3	Jersey ..	Attraction of Tuerong* ..	Not yet allotted	1.10.21	273	11	5,163	5·55	286·83	175	327	
				Canary of Tuerong	..	14·10.21	269	11½	5,133	5·17	265·41	175	302½	
				Werribee Northwood's Attraction	6538	20.10.21	273	12½	6,235	5·48	341·49	250	389¼	
Finn Brothers, Bundoora	4	4	Jersey ..	Tulip 2nd of Meridale ..	Not yet allotted	9.10.21	273	11½	6,915	5·18	358·45	200	408¾	305
				Curiosity of Holmwood ..	6483	30.10.21	273	11½	5,551	5·37	297·84	250	339½	
				Valda's Queen of Somerville	5948	13.11.21	273	14	7,364	4·56	336·07	250	383	464
				Foxglove 2nd of Tarnpirr ..	7054	21.11.21	273	16	5,940	5·84	346·85	250	395½	249
W. Fixter, Boisdale	1	1	Jersey	Beauty's Daffodil of Lesterfield	Not yet allotted	15.12.21	273	28	7,663	4·75	363·97	250	415	304, 208
Flack and Sewell, Berwick	15	12	Friesian	Springfield No. 4	Not yet allotted	1.10.21	273	19½	8,107	3·61	292·66	175	333¾	
				Dominion Cora	261	4.10.21	273	22½	10,835	3·44	372·59	250	424¾	269, 305
				Holland Lass 2nd of Berry ..	244	5.10.21	273	21	11,864	3·41	404·05	250	460½	204, 419
				Dominion Iona	263	5.10.21	265	14½	12,303	3·11	382·17	250	435¾	336, 225, 361
				Dutch Girl 2nd of Berry ..	221	9.10.21	273	21	9,920	3·74	371·37	250	423½	208, 327
				Dominion Violet Fobes ..	255	10.10.21	273	20	13,676	3·40	465·04	250	530¼	466, 308, 484
				Dutch Girl of Berry ..	141	16.10.21	273	20½	9,033	3·46	312·56	250	356¼	
				Monovale Catriona Paxton ..	551	19.10.21	273	27½	11,846	3·48	412·49	200	470¼	356
				Monovale Primrose Paxton ..	200	18.11.21	265	4	6,971	3·67	255·63	200	291½	
				Lady Thenea Alcartra ..	203	26.11.21	273	8½	7,885	3·18	250·62	250	285¾	
				Burnbank Mercedes Maggie ..	Not yet allotted	2.12.21	273	25½	9,326	3·30	307·32	175	350¼	
				Dominion Homestead Maggie	259	7.12.21	249	4	9,744	3·24	315·67	250	359¾	330, 373

* Exempted nine days—injury to udder.

CERTIFICATED COWS—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test	Milk last Day of Test	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs		lbs.	lbs.	lbs.	
Mrs. M. and W. A. Francis, Kilcunda	2	1	Ayrshire	Olive Berry of Glenbrae ..	5912	28.10.21	273	11	6,721	4·06	272·63	200	310¾	184
M. Galbraith, Tyers	4	4	Ayrshire	Crissy 2nd of Rathlyn ..	7292	8.10.21	236	4	5,824	4·60	267 71	250	305½	
				Dahlia of Retreat	4324	17.10.21	230	4	6,398	4·60	293·68	250	334¾	253
				Marigold of Retreat	4333	24.10 21	208	4	6.148	4 44	273 04	250	311½	
				Daphne of Mt. Hope	7293	8.11.21	226	4	4,472	4 10	183·31	175	209	
G. Gange, Mininera	6	2	Ayrshire	Eva 2nd of Glencairn ..	7298	29.9.21	273	18	6,596	4·01	270·44	200	308½	280
				Wisteria of Kelvin Grove ..	3298	24.10.21	273	7	6,644	4·02	267·08	200	304½	300
N. Gange, Mininera	2	2	Ayrshire	Petal of Roseleigh	7303	22.11.21	273	8½	6,571	3·63	238 26	200	271¾	
				Winnie of Kelvin Grove ..	4849	12.12 21	273	11	6,492	4·50	291·90	200	332¾	
Geelong Harbor Trust, Marshall	8	8	Ayrshire	May of Sparrovale .. .	3902	2.10.21	273	12½	8,439	4·14	349·77	250	398¾	236, 267, 276
				Meadow Sweet of Sparrovale..	3903	5.10.21	273	6	6,684	4·40	294·19	250	335½	278, 316, 360
				Daisy of Sparrovale ..	3888	25.10.21	273	9¼	6,556	4·55	298·00	250	339¾	290, 317
				Beatrice of Sparrovale ..	3882	30.10.21	273	6	7,188	3·90	280·11	250	319½	286, 253, 259
				Blossom of Sparrovale ..	3885	24.11.21	273	9	6,849	4·34	306·91	250	349¾	266, 315
				Mabel of Sparrovale ..	7315	1.12.21	273	15½	6,123	4·18	255·73	175	291½	
				Flora of Sparrovale.. ..	3891	8.12.21	273	5½	6,271	4·62	289·77	250	330½	203, 287, 307
				Melba of Sparrovale .	3904	15.12.21	273	11	6,366	4·30	273·84	250	312½	264, 287
H. S. Gibson, Murraydale	5	5	Ayrshire	Lupin of Ellerslie	7577	25.9.21	273	7	6,591	3·76	248·02	200	282¾	
				Dulcie of Evergreen. ..	9115	7.10.21	273	14	6,072	4·33	262·90	175	299¾	
				Lady Em of Evergreen ..	7320	15.10.21	273	7	5,820	4·07	237·67	200	271	242
				Trixie of Evergreen ..	6362	23.10.21	273	5½	8,770	4·54	398·40	250	454½	332, 375
				Princess of Winslade ..	6984	2.12.21	259	5½	4,552	4·97	226·25	200	258	

CERTIFICATED COWS—*continued*.

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
R. Goodman, Kilmany South	1	Nil	Ayrshire											
D. F. Griffiths, Inverleigh	4	4	Ayrshire	Rachel of Gowrie Park .	5185	25.9.21	273	16½	7,065	3·97	280·92	250	320¼	
				Joy of Struan Park.. ..	5182	29.9.21	273	18½	8,107	4 71	381·76	250	435¼	
				Gladness of Gowrie Park ..	5177	3.10.21	273	16½	8,475	4·40	372·97	250	425¼	
				Heather of Struan Park .	5180	27.10.21	273	14	6,305	4·57	288·13	250	328½	
R. Hall, Sale ..	3	2	Ayrshire	Phyllis of Dunachton .	5199	25 9 21	256	4	6,073	4·24	257·62	200	293¾	200
				Viola of Dunachton ..	5200	24.10 21	273	10	7,034	3 50	246 31	200	280¾	194
T. Harvey, Boisdale	1	1	Jersey .	Daisy 9th of Jerseyholm .	9392	10 12.21	273	17½	5.033	5·25	264·39	175	301¼	
Dr. and Mrs. Henderson	2	Nil	Jersey											
	2	Nil	Red Poll											
W. Henderson, Grasmere	16	1	Ayrshire	Betsey 6th of Carracoorte .	9316	28.9 21	207	4	4,041	4·42	178·81	175	203¾	
J. H. Hunter, Tyntynder Central	2	2	Jersey ..	Quality 8th of Melrose ..	6943	30.10 21	273	19½	8,008	5·66	453·22	250	516¾	320, 357
				Tiny of Tarnpirr	5172	31.10.21	273	10	6,235	5 92	369·20	250	421	386, 357, 387

Certificated Cows—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
J. Hutchinson, Somerville	2	2	Jersey ..	Northwood Queen of Somerville	9417	25.10.21	273	18½	6,689	5·03	336·57	175	383¾	
				Thana's Madeira of Somerville	9419	14.12.21	273	14	4,834	5·39	260·55	175	297	
S. A. Johnson, Wood-end	2	1	Ayrshire	Bernice of La Motte ..	Not yet allotted	9.11.21	220	8½	3,594	5·08	182·48	175	208	
A. W. Jones, Whittington, near Geelong	8	5	Jersey ..	Lady Grey 12th of St. Albans	..	22.10.21	273	8½	5,089	5·94	302·46	200	344¾	321
				Lady Grey 15th of St. Albans	..	12.11.21	273	20½	5,987	5·20	311·14	175	354¾	
				Fuchsia of St. Albans ..	..	3.12.21	273	22	6,399	5·12	327·54	175	373½	
				Lady Grey 8th of St. Albans..	4187	21.12.21	273	8	5,917	4·49	265·82	250	303	382, 432, 459, 405, 409
				Blanchette 5th of St. Albans..	Not yet allotted	21.12.21	273	20	5,483	5·17	283·29	175	323	
	11	11	Friesian	Her Royal Highness ..	359	2.10.21	273	35	14,415	3·06	440·68	250	502½	355, 396
				Daffodil Mercena	Not yet allotted	14.10.21	273	32	12,917	3·75	484·22	200	542½	326
				St. Alban's Lady	360	27.10.21	273	24	9,289	4·07	377·92	250	430¾	
				Ransome Lass 2nd	Not yet allotted	7.11.21	273	24	8,304	3·59	298·45	175	340¼	279, 328
				Beryl of Craigneil	,,	7.11.21	273	19	7,930	3·70	293·55	175	334½	
				Queen Curley	,,	13.11.21	273	27	11,985	3·52	421·69	200	480¾	288
				May Queen 2nd	347	23.11.21	273	30	12,587	4·24	534·26	250	609	410, 519, 617, 391
				Gaiety of Craigneil	Not yet allotted	27.11.21	273	26½	7,934	3·78	99·942	175	342	
				Stately of Craigneil ..	,,	2.11.21	273	20½	10,294	3·40	349·59	200	398½	274
				Westmere Inda Pietertje ..	,,	15.12.21	273	24½	8,925	3·90	348·50	175	397¼	
				Buttermaid 2nd	,,	23.12.21	273	24	11,287	3·92	441·92	200	503¾	311
A. Joshua, Berwick	6	5	Jersey ..	Lady Golden of Brucedale ..	..	6.10.21	273	8½	3,610	5·65	204·15	175	232¾	
				Glenida	4954	22.10.21	273	14	5,797	4·71	272·76	250	311	318
				Gaiety Girl 11th of Melrose ..	9442	22.10.21	273	8½	4,340	5·73	248·89	175	283¾	
				Silver Daisy of Terara ..	Not yet allotted	2.11.21	273	15	4,862	6·12	297·53	175	339¼	
				Mistletoe 3rd of Tarnpirr ..	9443	21.12.21	273	6	4,826	5·88	283·56	175	323¼	
G. Kent, junr., Archie's Creek	2	2	Ayrshire	Peggy of Woollamai Park ..	5275	8.10.21	269	7½	5,436	4·49	244·22	200	278½	224
				Princess of Woollamai Park ..	6478	17.10.21	273	13	5,700	4·44	252·95	175	288½	

CERTIFICATED COWS—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
A. Kirby, Daylesford	1	Nil	Ayrshire											
Kerr Brothers, Bacchus Marsh	8	7	Shorthorn	Morven Duchess 15th ..	Not yet allotted	26.9.21	271	18	9,811	3·81	374·49	250	427	285, 350
				Morven Duchess 29th ..	"	15.10.21	273	18½	6,335	3·91	247·45	175	282	
				Morven Daphne 14th ..	"	16.10.21	273	19½	6,961	4·02	279·70	175	318¾	
				Morven Cresseda 2nd ..	"	16.10.21	273	12	6,201	4·03	250·10	250	285¼	236
				Morven Ruby 3rd	"	1.11.21	273	17	6,044	4·18	252·36	175	287¾	
				Morven Daisy 7th	"	2.11.21	273	17	6,626	4·38	289·94	175	330½	
				Morven Queenie 10th ..	"	24.11.21	273	6	7,291	3·83	279·13	250	318¼	276, 272
J. A. Lang, Warrion	2	1	Ayrshire	Goodness of Roxburgh ..	3822	21.10.21	273	6½	6,697	3·95	264 38	250	301½	297
P. H. Lawrence, Agnes	1	1	Jersey ..	Nobles Morocco of Rainga ..	9456	19.10.21	273	19	5,752	4·62	265·75	175	303	
C. Lees, Lockington	8	4	Jersey ..	Bertha of Winslade.. ..	6979	6.10.21	273	7	8,316	4·56	379·28	200	432¼	
				Snowdrift of Gleneira ..	9750	5.11.21	273	15½	7,712	4·18	322·13	250	367¼	
				Pansy of Gleneira	8464	6.11.21	273	11	6,508	4·32	281·27	175	320¾	
				Aspect of Gleneira	9730	7.12.21	273	10	7,211	4·02	290·19	200	330¾	
E. M. Lennie, Tongala	4	4	Jersey ..	Primrose 2nd of Tarnpirr ..	7061	4.11.21	273	14	6,052	5·88	355·71	250	405½	212
				Tea Rose of Tarnpirr ..	Not yet allotted	14.12.21	273	18½	6,216	6·22	387·66	200	428¼	
				Starbright of Lynroy ..	9759	15.12.21	273	21½	6,527	5·60	365·36	250	416½	
				Show Girl of Tarnpirr ..	Not yet allotted	23.12.21	273	20½	6,265	5·53	346·36	175	394¾	

Certificated Cows—*continued*.

Owner.	No. completed Test.	No Certificated	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test	Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs	lbs		lbs.	lbs.	lbs.	
Agricultural High School, Leongatha	1	1	Jersey ..	Sunset Star of Dunalister ..	5927	24 10 21	273	13	8,080	5 47	441 97	250	504	350, 380, 495, 469
Mrs. E. Lithgow, Lilydale	2	2	Red Poll	Plum of Corriedale* .	Not yet allotted	12.11.21	250	4	6,264	4·76	298 14	200	340	243
				Pareena Peace .. .		14.11.21	273	16½	5,721	4 63	264 85	175	302	
C. D Lloyd, Malvern	9	9	Jersey ..	Gingerbread of Glen Iris	5197	26 9 21	273	15	7,281	5 58	406·11	250	463	309, 265, 320, 384
				Golden Fern of Glen Iris	6058	28 9 21	270	4	5,919	6·09	360·59	250	411	243, 332, 399
				Ryebread of Glen Iris	6059	1.10.21	273	8	5,150	5 06	260 61	250	297	230, 322, 293
				Fancy Bread of Glen Iris	Not yet allotted	2.10.21	273	7½	5,003	5·32	265·91	200	303¼	257
				White Stockings 4th	6062	27.10.21	161†	31½	5,986	4·42	264·73	250	301½	405, 398, 421
				White Cake of Glen Iris .	7112	17.11.21	189‡	19½	4,565	5·31	242·57	200	276¾	291
				Rye Cake of Glen Iris	7111	2.12.21	273	7½	4,121	5·98	246·23	200	280½	229
				Starbrights Princess	Not yet allotted	11.12.21	273	16	5,442	6·31	343·32	175	391¼	
				Violas Golden Princess .	"	22.12.21	273	11	4,869	6·20	301·91	175	344½	
H. Luxton, Whittlesea	3	2	Jersey ..	Mary Anne of Banyule .	6072	2.10.21	273	22½	8,405	5·07	426 22	250	486	334, 441
				Pearl 5th of Holmwood .	6492	23 11·21	273	13½	7,827	4·83	378 23	250	431½	339, 345
C. G Lyon and R. R. Kerr	12	12	..	Thora 9th of Banyule .	9510	26.9.21	273	18	4,903	5 51	270·17	175	308	
				Silvermine 22nd of Banyule	9505	3.10.21	273	18½	5,689	5·13	291·83	175	332½	
				Milkmaid of Banyule	9497	12.10 21	273	16	6,499	4·52	293·47	175	334¾	
				Lotus of Banyule .. .	7121	14.10 21	273	14½	5,032	5·98	301·13	200	343¾	291
				Silvermine 18th of Banyule .	6080	16.10.21	273	24½	8,096	5·55	449·13	250	512	358, 432
				Audrey Lotus of Banyule .	9478	16.10.21	273	16	5,392	5·09	274·36	175	312¾	
				Silver Fein 2nd of Kameruka	.	21.10.21	273	20	6,403	5·55	355·27	175	405	
				Marigold of Banyule	9492	26 10.21	273	17	5,361	5·60	300·03	175	342	
				Harpsichord of Banyule ..	9483	29·10·21	273	27	8,358	4·77	398·38	175	454¼	
				Thora's Audrey of Elouera ..	9705	3.11.21	273	17½	5,928	5·07	300·30	175	342½	
				Semiramis 3rd of Kameruka	Not yet allotted.	5.11.21	273	17	4,652	5·05	234·83	175	267¾	
				Machree of Banyule .	9490	17.11.21	273	13½	4,577	6 05	276·80	175	315¼	

* Previous record published under name of Plum. † Died before completing test. ‡ Sold before completing test.

CERTIFICATED COWS—*continued*.

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
L. McFarlane, Bundoora	10	4	Ayrshire	Peeress 2nd of Flinders	5407	10.10.21	273	9½	7,333	4·31	315·83	250	360	327, 336
				Beryl of Gleneira	2441	10.11.21	248	.4	6,596	4·28	282·27	250	321¾	393, 359, 355
				Virtue of Ayrbrae	7565	18.11.21	273	7	4,315	4·35	187·73	175	214	
				Cher Amie 3rd of Banyule .	6754	27.11.21	273	14	6,251	4·04	252·37	175	287¾	
W. McIvor, Moranding	2	2	Ayrshire	Foliage of Golden Vein ..	5423	7.12.21	273	18	6,392	4·34	277·62	200	316½	
				Edith of Golden Vein ..	5419	19 12 21	235	4	5,458	5·06	276·23	250	315	
W. J. McKernan, Tatura	1	1	Ayrshire	Hazel of Locheden	10014	14.10 21	273	16	5,946	4·65	277·65	175	316½	
R. Maher, Wyuna South	1	1	Jersey ..	Pansy of Rosemont .	..	9.10.21	273	13½	4,826	5·33	257·09	175	293	
P. J. Maloney, Tongala	4	4	Jersey ..	Lady of Belgonia	Not yet allotted	26.9.21	273	8	5,625	5·27	296·32	200	337¾	243
				Bonnie of Belgonia .	9549	1.10.21	273	14	6,084	5·49	334.24	175	381	
				Beauty of Belgonia ..	9548	7.10.21	273	16	7,738	5·16	399·76	175	455¾	
				Marie of Bonshaw	7171	1.11.21	273	14	8,015	4·58	367·31	250	418¾	241, 297
W. Meredith, Ondit	2	Nil	Ayrshire											
T. Mesley, Dalyston	3	3	Jersey ..	Peggy Pride of Warenda ..	Not yet allotted	9.10.21	273	13½	4,435	6·72	298·08	175	339¾	
				Namesake 2nd	5251	13.10.21	273	23	7,726	4·92	379·95	250	433¼	
				Florrie of Warrenda ..	7190	4·12·21	257	5	4,975	5·76	286·77	200	327	
D. C. Miller, Agnes	2	2	Jersey ..	Ruby of Tarnpirr	Not yet allotted	8.10.21	273	18	5,703	5·08	289·78	175	330¼	
				Model of Kirkhill		24.10.21	273	10	4,417	5·53	244·12	175	278¼	

CERTIFICATED COWS—*continued.*

Owner.	No. Completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
H. J. Munro, Casterton	2	2	Ayrshire	Doris of Glencourt .. Elsie of Glencourt ..	6636 7543	25.9.21 24.10.21	273 273	7 10½	7,066 6,146	4·17 3·85	294·35 236·33	250 200	335½ 269½	
Mrs. Lilian Orchard, Graham Vale	5	2	Jersey ..	Tulip of Jerseyvale .. Rose of Jerseyvale ..	Not yet allotted	12.10.21 16.11.21	273 273	9½ 9½	5,150 4,026	5·05 4·91	260·18 197·86	200 175	296½ 225½	
T. H. Payne, Kilmore	4	4	Red Poll	Chance .. Daffodil .. Gratis .. Plumstead Permain ..	217AA 483E 218AA 219AA	6.10.21 7.10.21 8.11.21 15.12.21	273 248 273 273	5 4 11 20	6,368 6,570 6,799 6,401	3·96 4·72 4·17 4·26	252·06 309·95 283·80 272·89	250 250 250 200	287½ 353½ 323½ 311	234 357 325
H. Perdriau, Werribee	2	1	Ayrshire	Beauty of Quarry Hill ..	10135	9.10.21	273	6	6,124	5·02	307·46	250	350½	
J. Phillips, Murraydale	1	1	Jersey ..	Jessie 11th of Ferntree Vale..	Not yet allotted	27.10.21	273	16	8,616	4·46	383·87	200	437½	206
J. Platfuss ..	2	2	Friesian	Monavale Juno Paxton .. Westmere Oakwood Duchess	169 Not yet allotted	29.10.21 3.11.21	273 273	29 33	11,913 10,319	3·34 3·34	398·47 344·95	200 175	454½ 393½	326
R. Ralston, Moglonemby	4	3	Ayrshire	Crissie of Willow Vale .. Veronica of Ben Kell .. Adella of Ben Kell ..	6736 5755 5745	10.10.21 23.10.21 29.10.21	273 273 273	11½ 8½ 10½	5,521 5,305 5,497	3·80 4·06 4·12	209·66 215·15 226·48	175 200 200	239 245½ 258½	212
Miss Bruce Reid, Bundoora	8	1	Jersey ..	Mauve Lilac of Kamaruka ..	7349	3.12.21	273	9	4,757	5·79	275·54	250	314½	342, 292

Certificated Cows—continued.

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
C. J. Reid, Devenish	1	Nil	Jersey											
Miss S. L. Robinson, East Malvern	2	2	Jersey	Golden Betty	7227	4.12.21	273	20	6,054	4·26	257·98	250	294	
				Kyora's Velveteen ..	Not yet allotted	9.12.21	273	16	4,779	5·13	245·11	175	279½	
J. H. Rogers, Yarraville	4	3	Ayrshire	Ella of Ellerslie	4392	23.10.21	273	11½	7,083	3·83	271·18	250	309¼	
				Bonnie of Glencairn ..	56*0	24.10.21	273	20	8,567	3·64	311·48	250	355¼	203, 296
				Daisy of Bundara	4258	24.11.21	252	4	6,919	4·25	294·00	250	325¼	393, 450, 454
G. Rowe, Kardella	6	4	Jersey ..	Sweet Pansy 5th of Melrose	7400	4.10.21	273	16	5,401	6·71	362·42	250	413¼	245, 311
				Rosette of Hillcrest	Not yet allotted	10.10.21	273	13½	5,171	4.75	245·60	175	280	
				Joy of Hillcrest	„	19.10.21	273	8	3,741	5.49	205·41	175	234¼	
				Pattie of Hillcrest	„	3.12.21	273	10	4,356	4·69	204·41	200	233	207
S. Russell, Tongala	2	2	Friesian	St. Alban's Lily	362	10.10.21	273	17	8,142	3·23	263·31	200	300¼	
				Springfield No. 9	Not yet allotted	23.10.21	273	32½	9,824	3·63	356·82	175	406¾	
F. Sadler, Camperdown	7	4	Shorthorn	Roan Ada 4th	Not yet allotted	14.10.21	273	20½	7,275	3·45	251·03	250	286¼	300, 280, 303
				Pearl Red 28th	„	5.11.21	273	18½	5,476	4·06	222·46	175	253¾	
				Diana 6th of Braelands ..	„	9.11.20	273	17½	8,222	3·96	325·84	250	371½	393
				Red Pet	„	12.11.21	273	9	6,443	4·18	269·12	250	306¾	343, 287
Sadler Brothers, Noorat	8	5	Ayrshire	Pearl of Burnbrae	4620	29.9.21	273	22	8.975	4·24	380·68	250	434	343
				Celia of Burnbrae	4608	17.10.21	273	7	6,518	4·02	262·23	250	299	247
				Laurel of Burnbrae ..	4615	24.10.21	260	4	6,954	3·92	272·67	250	310¾	285, 317
				Greta of Burnbrae	6844	6.12.21	273	21	6,725	3·90	262·17	250	298¾	246
				Patricia of Kilmarnock ..	10278	8.12.21	273	12	5,550	3·80	210·67	175	240¼	

Certificated Cows—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
Agricultural High School, Sale	2	2	Ayrshire	Gladiana of La Trobe	4809	25.9.21	273	6½	4,678	5.21	243·69	200	277¾	221
				Gladys of Ellerslie	4810	15.10.21	273	7½	5,979	4·47	267·56	250	305	295, 253
A. H. Schier, Glen Forbes	20	11	Ayrshire	Madeline of Inverleigh ..	5856	26.9.21	273	5	4,562	4·44	202·66	200	231	
				Dolores 2nd. of Banyule ..	10286	27.9.21	273	7	3,892	4·62	179·71	175	204¾	
				Snowdrop of Inverleigh ..	5865	29.9.21	273	4	6,322	4·32	273·13	200	311¼	221
				Pearl Queen of Wethersdane	7452	1.10.21	273	4½	5,314	4·01	213·28	200	243¼	241
				Profit of Roxburgh ..	6330	7.10.21	260	4	5,604	3·61	202·24	175	230¼	
				Milkmaid of Inverleigh ..	5859	12.10.21	256	4	5,688	3·91	222·44	200	253½	
				Queen of Scots 2nd of Banyule	10290	17.10.21	257	4	4,628	4·66	215·78	175	246	
				Boronia 2nd of Pine Grove ..	4626	3.11.21	273	5	5,727	4·86	278·52	250	317½	269, 226, 281
				Gold Point 2nd of Banyule ..	10288	10.11.21	273	7½	4,730	4·74	224·38	175	255¾	
				Modesty of Inverleigh ..	5861	16.12.21	276	19	6,576	3·76	247·09	200	281¾	223
				Fine Quality of Gleneira ..	7711	18.12.21	273	9½	4,557	4·37	209·26	200	238½	187
J. Scott, Chiltern ..	3	3	Jersey ..	Irish Flavour of Eloura ..	9700	3.10.21	273	14	4,911	5·43	266·54	175	303¾	
				Irish Eyes of Eloura ..	9699	4.12.21	273	15	3,870	6·21	236·28	175	269¼	
				Cora 2nd of Havilah ..	6064	25.9.21	261	4	6,082	4·91	298·48	250	340¼	320, 361
Mrs. E. Sims, Toolern Vale	1	1	Jersey	Marie of Tarnpirr	6029	19.10.21	273	5½	4,875	5·95	290·19	250	330¾	282, 266
O. J. Syme, Macedon	6	5	Friesian	Jennie de Kol	301	30.9.21	273	24½	10,571	3·48	368·00	250	419½	348, 400, 319
				Duplicate Posch Maud ..	300	9.10.21	273	7	13,665	3·42	466·75	250	532	391, 348, 420, 365
				Bolobek Dora	345	16.10.21	273	20	8,073	3·87	312·44	175	356¼	
				Colantha Curley Segis ..	Not yet allotted	22.10.21	273	9½	8,336	3·62	301·95	175	344¼	
				Bolobek Edith	337	31.10.21	273	25	8,545	3·77	322·45	200	367¼	

CERTIFICATED COWS—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
J. R. Telford, Kyabram	5	5	Ayrshire	Cora of Hyde Park ..	5997	12.9.21	273	5½	4,480	5·05	226·06	200	257¾	
				Adora of Fern Hill	5924	6.10.21	273	15	8,258	4·22	348.58	250	397¾	
				Countess of Byrneside ..	5998	20.10.21	273	4½	7,471	4·16	310·90	250	354¾	
				Dolly 4th of Glengowrie ..	5999	21.10.21	273	22½	8,492	4·42	375·64	175	428¼	
				Pearlie of Hyde Park ..	6919	30.11.21	273	9½	5,536	4·68	258·98	175	295¼	
W. Tendeson, Merrigum	2	2	Jersey ..	May Queen of Brookside ..	9722	14.11.21	273	20½	8,026	4·36	349·94	200	399	
				Silvermine of Brookside ..	9724	18.12.21	273	6	5,439	5·29	287·56	250	327¾	
J. H. Thorburn, Woodend North	3	3	Ayrshire	Jean of La Motte	6014	26.9.21	248	4	5,536	4·14	228·93	200	261	
				Oatland's Beauty	6927	28.9.21	273	4	4,147	4·71	195·13	175	222¾	
				Oatland's Maggie	6928	5.11.21	225	4	4,615	4·44	205·14	175	234	
F. Trevaskis, Tongala	1	1	Jersey ..	Romany Girl 2nd of Tarnpirr	7062	14.10.21	273	8	5,145	5·44	279·90	200	319	243
J. T. Tweedle, Sunbury	8	8	Friesian	Ashlynn 25	Not yet allotted	7.10.21	273	23	8,705	3·36	292·29	200	333¼	
				Ashlynn 52	,,	25.10.21	273	11½	6,803	3·86	263·16	175	300	
				Jessie Fobes Homestead of Oakview	,,	29.10.21	273	13	6,682	3·75	250·40	175	285	
				Ashlynn 56	,,	1.11.21	273	10	6,565	3·87	253·78	175	289¾	
				Ashlynn 57	,,	2.11.21	273	16½	7,667	3·53	270·59	175	308¾	
				Ashlynn 33	,,	1.12.21	273	18	7,494	3·69	276·62	200	315¼	
				Rosevale Jessie Posch ..	,,	4.12.21	272	24	10,829	3·27	353·62	175	403¼	
				Rosevale Rosie Abbekirk ..	,,	7.12.21	269	22½	11,398	3·05	347·42	175	396	
G. Vallence, Bacchus Marsh	2	1	Ayrshire	Ruby of Banyule	6792	6.10.21	273	11	6,577	3·76	247·37	200	282	
W. M. Vale, Woodside, near Yarram	2	1	Jersey ..	Lady Pattie of Ferndale ..	Not yet allotted	11.11.21	273	12½	6,377	5·30	338·12	200	385½	259

Certificated Cows—*continued.*

Owner.	No. completed Test.	No. Certificated.	Breed.	Name of Cow.	Herd Book No.	Date of Calving.	Days in Test.	Milk last Day of Test.	Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Butter.	Previous Butter Fat Records in lbs.
								lbs.	lbs.		lbs.	lbs.	lbs.	
G. Waite, Werribee	4	4	Friesian	Countess of Ashby ..	326	1.11.21	273	24½	7,792	3·29	256·26	250	292¼	
				Satsuma	459	8.11.21	245*	12	6,086	3·68	225·12	200	256¾	
				Countess 3rd of Ashby ..	Not yet allotted	29.11.21	273	16	7,731	3·23	250·00	175	285	
				Japana	461	5.12.21	273	..	7,207	3·52	253·83	200	289½	
A. L. Walter, Little River	2	2	Jersey ..	Rosebud of Tarnpirr ..	4210	29.9.21	273	17	6,228	5·71	355·87	250	405¾	276, 377, 347
				Postcard of Tarnpirr ..	5167	6.11.21	273	13	5,869	6·21	364·29	250	415¼	338, 342
Agricultural High School, Warrnambool	2	Nil	Ayrshire											
H. L. Webb, Sunbury	4	4	Ayrshire	Milkmaid of Holly Green ..	6045	14.10.21	273	19	7.959	3·73	297·02	250	338½	
				Narcissa of Blackwood Park..	4777	24.10.21	273	13	6,730	4·11	276·85	250	315½	
				Empress of Holly Green† ..	6042	30.10.21	273	18	6,110	4·31	263·17	200	300	
				Melba of Holly Green ..	6952	4.11.21	273	13½	4,969	4·43	220·23	175	251	
J. Wills, Bacchus Marsh	1	1	Friesian	Bolobek Janet	340	8.10.21	255	4	9,778	3·58	350·40	200	399½	
W. Woodmason, Murrumbeena	8	8	Jersey	Jessie 24th of Melrose ..	Not yet allotted	29.9.21	273	17	7,251	5·84	423·74	200	483	311
				Pearl 10th of Melrose ..	Not yet allotted	10.10.21	267	8	4,445	6·13	272·49	175	310¾	
				Gaiety Girl 10th of Melrose ..	Not yet allotted	6.10.21	273	18	5,940	6·21	368·70	200	420¼	276
				Jessie 15th of Melrose ..	5546	22.10.21	273	16½	5,810	5·86	340·26	250	388	270, 326, 351, 361, 356
				Jessie 22nd of Melrose ..	Not yet allotted	2.11.21	273	15½	5,288	6·20	327·93	250	374	348
				Rarity 7th of Melrose ..	5559	11.11.21	273	15½	7,510	4·76	357·61	250	407¾	254, 325
				Jessie 21st of Melrose ..	9885	12.11.21	273	15¼	5,977	5·83	348·33	250	397	
				Graceful Duchess 11th of Melrose No. 1	6981	10.12.21	273	22½	6,971	6·21	433·08	250	493¾	370, 538, 506, 460

* Sold before completing test. † Entry deferred three weeks—calving trouble.

GEELONG FARM COMPETITION.

Conducted by Geelong Agricultural and Pastoral Society.

Report of Judge, H. A. Mullett, B.Ag.Sc., Chief Field Officer.

The principal function of an Agricultural Society is to foster agricultural progress in the rural community. But in many cases Victorian Societies do little more in that direction than hold their Annual Shows. Properly conducted, the Agricultural Show is undoubtedly a valuable educational medium, but in the increasing tendency towards excessive development of side-shows and novelties there is a real danger of the original purpose of the Shows being subordinated. When a Society permits its side-shows to grow at full proportion to the agricultural exhibits, then it reduces itself to the level of concerns which exist to make money out of amusement.

"Springfield Avenue," Moolap.
Comfortable farm home of Mr. D. O'Halloran—winner, Large Farm Section.

Fortunately, within recent years a number of the Societies have not overlooked their true function, and have endeavoured to maintain a reasonable balance between the purely profit-earning part of their work and the educational. The reorganized Geelong Agricultural and Pastoral Society is one of these. New educational features added to their schedule this year are Farm Competitions, and Boys and Girls' Calf and Pig Clubs. The results obtained have certainly justified the effort.

The Aim of the Competition.

In the Farm Competition, with which this report is alone concerned, there were three classes—(A) for farms of 100 acres and over, (B) for farms of under 100 acres, (C) for farms owned by returned soldiers settled under the repatriation scheme. The object is to promote better farming methods, good farm management, more effective improvements, and to secure improvement in the farm environment generally,

by means of the healthy rivalry generated by competition and example. There were eleven entries, comprising seven in Class A, one in Class B, and three in Class C. The quality of the competing farms was so good and the interest excited so keen that it will be surprising if Geelong

The Drive at "Grassdale."
Awarded second prize—Large Farm Section. (Property of Executors of late F. J. Leary and E. E. Hendry.)

Judging "Grassdale."
Representatives of Geelong Agricultural Society and the Press. Mr. Ham, President of the Society, in the centre.

farming does not benefit as a result of the powerful fillip it has received.

THE DISTRICT.

From a soil, climatic and market point of view Geelong is a favoured district. The rainfall ranges from 22 inches annually on the high

volcanic plain to 25 inches in the Moriac and Buckley districts. The greater part of the land to the north and east is plain liberally sprinkled with volcanic floaters and "stony rises." But the soil is a retentive clay capable of growing good crops of wheat and barley, and is unequalled for oaten hay. To the south and west—that is, nearer the sea coast—the land is more undulating, and consists of sandy loam overlying clay. Here oats, barley, dun peas, and certain artificial grasses and clovers have been shown to thrive on what was once looked upon as merely grazing country. These elevated areas are intersected by the Barwon and Moorabool rivers and their tributaries. Great valleys have thus been carved out. They contain rich flats and slopes. Their fertility has largely been contributed to by the volcanic soils eroded by the rivers, and by the extensive beds of limestone cut through. Between the Barwon and the Moorabool lie the Barrabool hills, with their rich chocolate volcanic soils, but they are a thing apart from the volcanic plains, as also are the friable black volcanic loams which fringe the sea coast in the Moolap district. It is on the river flats, on the Barrabool hills, and at Moolap and Moriac that the greatest agricultural development has taken place. In these areas the more intensive types of farming may be practised.

If there are any outstanding impressions of a week's critical inspection of the farms in the Geelong district they are these—the highly improved farm environments seen, especially in the planting of trees and hedges, the thoroughly diversified character of the farming practised on individual farms, the extensive use of dun peas as a catch crop and as a soil renovator, and the excellent results that attend the planting of subterranean clover and lucerne in the moister parts of the district. Further than that, most of the live stock noticed, except draught horses, were high class.

Judging the Competition.

The farms were judged on a scale of points prepared by the Geelong Society. Full details of these are shown at the head of the tabulated list of marks awarded. Because there were not sufficient entries to warrant further subdivision of the classes, dairy farms had to be measured by the same standard as cereal and sheep farms, with attendant difficulties in making fair comparisons. The result was that farms with the greatest diversification scored most consistently, and were able to beat less diversified farms where individual items such as live stock, &c., were often very meritorious and really worthy of greater consideration than the scale of points allowed. In future, however, the Geelong Agricultural Society will no doubt see to it that, provided there are sufficient entries, further subdivisions of the classes are made.

Awards.

Mr. D. O'Halloran secured 232 marks out of a possible 310 in Class A. He is therefore placed first. The Executors of the late Mr. F. J. Leary and Mr. E. E. Hendy were awarded 229 points and second place with their Grassdale entry. Then follow Mr. W. J. Muhleback, 225; Mr. R. Purnell, 224; and Messrs. Leigh Bros., 204.

In Section B, Mr. J. J. Baker—whose entry was the only one received—was awarded 190 points and first place.

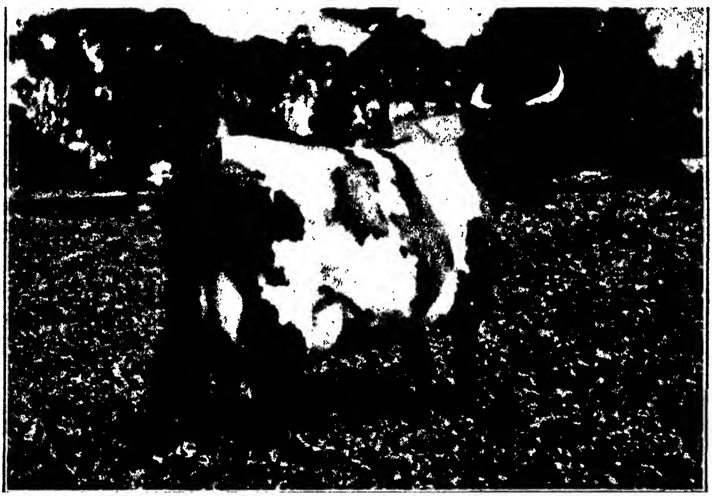
DETAILS OF AWARDS.

	Farming Methods.	Crops and Sown Grass.	Fallow.	Horses.	Sheep.	Cattle.	Pigs.	Poultry.	Plant and Implements.	Subdivision Fences, Gates.	Orchard and Vegetable Garden.	Water Supply.	Fodder Reserves.	Tree Planting.	Insurance.	Home and Buildings.	Total Points.
Possible Points	**35**	**20**	**20**	**25**	**20**	**25**	**15**	**10**	**20**	**20**	**10**	**20**	**20**	**20**	**5**	**25**	**310**
Section A—(Farms 100 acres and over).																	
D. O'Halloran	30	19	14	24	12	16	8	6	13	19	4	17	7	19	4	20	232
Executors late F. J. Leary and E. E. Hendy, "Grassdale"	30	18	16	19	13	11	1	6	17	16	6	15	18	20	4	19	229
W. J. Muhlebach	24	14	7	24	12	25	11	4	17	18	10	12	13	9	4	21	225
R. Purnell	27	12	13	15	15	18	12	5	15	13	3	18	15	18	5	20	224
Leigh Bros.	25	18	11	21	18	9	7	8	10	13	4	10	15	12	3	20	204
Executors late F. J. Leary and E. E. Hendy, "Woodlands"	25	15	13	18	5	8	5	5	13	17	6	14	16	19	3	20	202
S. J. Lugg	23	17	8	16	17	9	5	7	16	12	3	10	5	8	2	17	175
Section B—(Farms less than 100 acres).																	
J. J. Baker	25	16	5	16	0	20	15	9	15	16	5	18	5	7	2	16	190
Section C—(Farms settled by Returned Soldiers under Repatriation Scheme).																	
G. W. Evans	24	13	13	12	12	7	10	7	13	14	0	11	2	7	3	13	161
L. C. Kelly	26	19	7	17	0	8	0	0	13	12	4	9	10	1	3	14	143
B. Maddox	26	17	7	14	0	14	6	5	9	6	3	5	5	5	4	10	136

In Section C, Mr. G. W. Evans secured 161 points and first place, and Mr. L. C. Kelly, 143 points, was second.

Mr. D. O'Halloran's winning farm, "Springfield Avenue," is located at Moolap, some 5 to 6 miles south of Geelong. It comprises 449 acres of undulating country on the shores of Reedy Lake. The soil is a good quality sandy loam of dark colour. This farm won by its consistent scoring under every head for which marks were allotted.

It was very evident that the property is soundly managed and is a profitable investment to the owner. Mr. O'Halloran is a specialist in dealing in dairy cattle. He has been conducting his present business for fifty-three years. His reputation as a judge of the utility dairy cow is second to none in the Western District. It is his practice to buy the cows and then bring them into profit on his farm before selling them; beside that, he maintains a small permanent dairy herd of grade cows.



One of Mr. O'Halloran's grade cows, showing good dairy points.

The whole farm—its lay-out, subdivision, and the system under which it is being farmed—is organized for the particular business of the owner. There are twenty-six small paddocks, no one of which is greater than 36 acres. Great care has been taken in laying them out to have them accessible to each other, to water, to the farm yard, and to the drafting pens. A cropping system has been devised which provides for ample areas of luscious pasture, which is productive during a longer period of the year than usual. This is done by sowing down a liberal admixture of lucerne with the English rye grass. They are also top-dressed.

A feature of the place is the magnificent plantings of trees and hedges (kept well trimmed) which form the shelter belts about the paddocks and homestead. The home and farmstead are located on rising ground at the head of a broad, straight drive planted with

massive pines and well-grown sugar gums. From here the land slopes gently away on all points of the compass, and a view is commanded of nearly every paddock.

The farm buildings, stable, barn, cow-shed, pig-sties, and implement-sheds, &c., are neatly and conveniently arranged behind the house, and are surrounded by planted lanes which give access to the various paddocks on to the entrance drive. The public water supply is tapped at the road. The farm buildings and garden are served through pipes from a large dam, about 2,000 cubic yards, by windmill and tank. In all there are six dams and water-holes. The fencing, 13 miles in length, and the fifty or sixty wooden gates were first-class.

The entire boundary fence was of unusually stout construction. The box posts were interspersed with two heavy galvanized droppers. There were four galvanized plain wires and two barbed. The wire was of a gauge many times stouter than that ordinarily used, and was tightly strained and thoroughly well anchored.

Working horses of good stamp. (Mr. D. O'Halloran's, Moolap.)

Besides the dairy-herd of eighteen grade cows in milk, eighty other dairy cattle were being carried. In addition there were fifty sheep, four pigs, and eleven horses. The horses were considered equal to the best seen in the Competition.

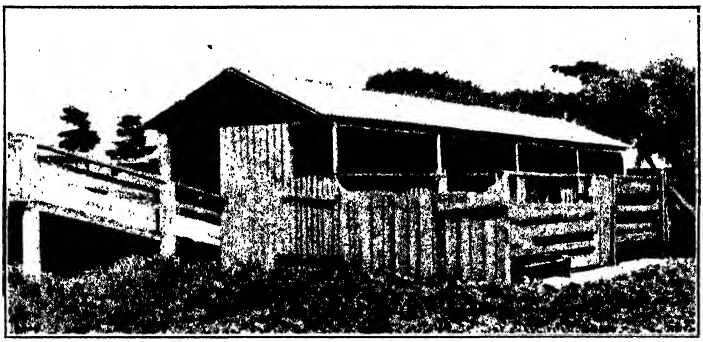
On this property from 80 to 100 acres are cropped each year, the balance being fallow or in grass, of which from 60 to 70 acres are under artificial grasses in full vigour, and a considerable portion of the remainder of the pasture showed evidence of having been sown down at some time. As a rule 60 acres are sown to Pryor malting barley, 30 acres to Algerian oats for hay, 15 acres to Currawa wheat for grain, and there are from 30 to 40 acres of fallow. The system followed is to sow oats for hay on the fallowed land, then seed barley on the oat stubbles or after the wheat. When it is desired to spell the paddock, one bushel of rye grass is sown with the barley crop. In the following year the stubbles are harrowed after the first rains and dressed with 3 to 4 lbs. of lucerne with 1 cwt. of superphosphate. The result, as evidenced by the pastures seen, is very profitable on this class of country. They were rich with burr clover among the

rye grass, while a plentiful admixture of lucerne could be seen which should be useful during the summer months.

Mr. O'Halloran top-dressed 23 acres with superphosphate at the rate of 1 cwt. per acre this year. The resultant growth fully justified the outlay. In addition, liming with shell lime from the shores of Reedy Lake is practised, 380 acres having been treated at the rate of forty loads per acre during the past forty years.

The shell is carted to the land in drays and spread by means of a land grader. From £2 per acre—the cost years ago—the cost has risen to £6 to £8 per acre now. The growing crops of wheat, oats and barley shown looked excellent.

The property of the executors of the late F. J. Leary and E. E. Hendy challenged the winner (D. O'Halloran) strongly in each branch. The farm consists of 1,040 acres of undulating loamy soil at Moriac. During the past seventeen years it has been developed from the rough in a most courageous way by the present owners. To-day it is a magnificently improved property, carefully subdivided, well provided



Convenient pig-styes, with loading-race, at Mr. O'Halloran's farm.

with water, and liberally planted with fine shelter belts of sugar gums and *pinus insignis*. In all there are five and a half miles of well-grown shelter belts on the property. As an effort to improve the farm environment it compares favorably with anything that has been done in the State. The homestead is approached through a planted drive, as are each of two comfortable workmen's cottages located in other parts of the farm.

Along with a number of others, including Messrs. Deppler Bros., Mr. R. Purnell, the late Mr. N. Morrison, and Mr. John Hunt, the proprietors of "Grassdale," have carried out a considerable amount of experimental work at Moriac. They succeeded in demonstrating that fine crops of oats, barley, dun peas, and lucerne can be grown, and that subterranean clover thrives. The following areas on "Grassdale" are cropped annually:—Oaten hay, 200 to 220 acres; barley, 30 acres; dun peas, 100 acres; there are also 8 acres of lucerne and 224 acres of subterranean clover. The balance of the area is in natural grass and fallow; an area of 174 acres has been fallowed this year with the mould-board plough. The rotation system practised is to precede the

cereal crops either with a fallow or with dun peas. The peas are usually grown on fallow. On much of the fallow a "catch" crop of millet is obtained. For hay 2 to $2\frac{1}{4}$ bushels of Algerian oats are used with 100 lbs. of superphosphate. The seeding is done in April and May.

For barley 2 bushels per acre are used with 100 lbs. of superphosphate; 3 bushels per acre is the rate of seeding preferred for dun peas, with 100 lbs. of superphosphate. The method of sowing the subterranean clover is either to plough up stubbles and sow at the rate of 4 lbs. per acre, or to seed with a cereal crop in April. The latter practice gives the best results. A remarkable instance of this was noticed in one of the fields during the inspection.

There are very few properties where such extensive plantings of subterranean clover have been made. This hardy plant has proved invaluable at "Grassdale" in improving the carrying capacity of the resting paddocks. Its prolificacy could be still further enhanced by top-dressing with superphosphate, or better still with superphosphate and marl in conjunction. On "Woodlands," a sister property of 775 acres, 100 acres have been "marled" at the rate of 100 loads per acre from a fine marl pit on the property. The marl was dumped in heaps about five yards apart and spread by driving a land grader of the louvre type across in two directions at right angles. The contract price was 1s. 3d. a load, plus the cost of spreading.

Heavy crop of Barley at "Grassdale."

The beneficial effect of the marl could be noticed in the subsequent crops, and in particular is the carrying capacity of the paddock, when spelled in grass, greatly increased. On both these properties it is the practice to buy the sheep as stores and then fatten them. At the time of judging, "Grassdale" was carrying 300 comeback ewes and lambs, and "Woodlands" was temporarily without sheep.

Dun peas are found a very payable crop. The average yield is about eight bags per acre, but up to ten bags are occasionally obtained. In

Homestead of Mr. W. J. Muhlebach. Third, Large Farm Section. (Cow-shed on the right; barn and cellar on the left.)

harvesting, the practice adopted is to rake the peas into rows, cure and cart them to the thresher direct. The waggons keep the machine fully employed, hence stacking charges, &c., are avoided. A feature of both properties was the provision of a number of mouse-proof hardwood stack stands, each capable of holding 80 to 90 tons of hay. In these, the spaces between the bearers was covered with wire netting in lieu of hardwood planking. At "Grassdale," there was a silo as well. Neat stacks of pea straw were noticed. The fodder reserves were adequate, the farm buildings solidly constructed, and the water-supply system satisfactory. Most of the crops looked well, some even a trifle rank. The fallow on "Grassdale" was well ploughed, but that on "Woodlands," which had been disked, was not so satisfactory. "Woodlands" and "Grassdale" each had 3½ acres of well-kept orchard.

Another property of undoubted merit was that of Mr. Muhlebach, "Retreat," Batesford. This farm of 284 acres is most picturesquely situated on the rich Moorabool flats. From the steep terraced slopes a couple of hundred feet high, which forms the northern boundary, a comprehensive view of the farm could be obtained. Immediately below the eye, 32 acres of evenly grown and exactly planted apples, pears, apricots stand out boldly against a background of perfectly tilled soil. From either side of a straight drive, paddocks of oats, barley, grass, lucerne are laid off squarely, and here and there groups of sleek dairy cattle and well-grown sheep may be seen. In the distance are grouped the boldly modelled farm buildings. The winding Moorabool with its shady trees flanks the whole of the southern boundary.

Besides its profitable orchard, this farm is also noted for its pedigree Ayrshire dairy cattle, and for some excellent pigs. The Ayrshires comprise 22 pure-bred cows, 10 calves, and 2 pure-bred bulls. At present, seven are in milk, and are undergoing the Government herd test. The head of the stud is Violet's King—a shapely animal with all the dairy points. He was second as a yearling at the Royal Show and first as a year-old. A yearling bull by him was awarded first place at the Royal Show last year.

The cows were in perfect condition, and are well housed in 14-bail cow-shed, 60 feet x 24 feet, with the stalls in a single row. The floor is paved with brick, and well drained. The shed faces east, and the boards on this wall are spaced to permit entrance of plenty of light. There is ample space behind the stalls for storing feed, and the mixing room is conveniently situated. An adequate supply of flushing water is available. The cows graze the natural pastures, and in the autumn

One of Mr. Muhlebach's pedigree Ayrshires.

have access to oats and barley forage, specially grown for them. In the summer, lucerne is available, and this year 10 acres of Wimmera rye grass has also been laid down for forage purposes.

There are some 20 acres of lucerne sown on the land nearest the river, that is, on the richest portion, also about 130 acres of cereals and forages, including 82 acres of oats, 18 acres of Federation wheat, 30 acres of barley, and 1½ acres of mangels are grown annually. Fallowing is not practised here, nor are peas now grown. A powerful steam pumping plant has been installed for irrigating the lucerne during the summer. For this the canvas hose system is adopted.

In all, there were about 560 Comeback ewes of excellent type, with lambs, most of which were in prime condition. They had been mated with Border Leicester and with English Leicester rams. Mr. Muhlebach proposes to give the Dorset Horn rams a trial. These will be thoroughly tested against the Border Leicester and the Shropshires.

As a rule, 400 ewes are lambed down here. Some points were deducted for the presence of foot-rot, otherwise these were the best sheep in the Competition.

The pigs consisted of three pedigreed Yorkshire and one Berkshire sows of good type. The litter and urine from the sties had been carefully preserved in a pit for use on the farm crops.

The Clydesdale draught horses seen showed evidence of quality, and were big active sorts. On the whole, the quality of the live stock on the place was the best in the competition.

Despite the high degree of specialization in the live stock, the principal source of revenue on "Retreat" is the orchard. This is laid down on good loamy land, but by no means the richest on the property. Besides the 32 acres in one block, there are 4 acres of recent plantings near the two homesteads. There are 2 acres of pears—"Ironbark" (Black Ackan), Prince William, and Packham's Triumph; 3 acres of apricots, of which Mansfield's Seedling are best; and 2 acres of plums.

The head of the dairy herd at "Retreat," Batesford.

The balance is in apples, principally Jonathan, but there are also Delicious, Cleopatra, Rome Beauties, &c. The orchard was very evenly grown, and the trees shaply and well developed. Great care is given to the tillage between the trees, to pruning, to manuring, and to provision for free cross-fertilization of the apples. In the autumn of each year, a barley and oats mixture is sown between the trees and fed off to sheep. This acts as a green manure. The residues are carefully ploughed under in mid-August, and from then on the soil is repeatedly worked with a spring-tooth cultivator, the "Harvey" cultivator being used to get close to the trees. Originally, considerable plantings had been made to the Horn variety of apple, and as these went out of favour, further Jonathans were grafted to the old stock. It was observed that there was a marked decline in the yields of trees in the vicinity, and especially to the windward of the new graftings. This led Mr. Muhlebach to experiment with methods of cross-fertilizing. The

system now found most satisfactory after considerable testing is to graft a small branch of Cleopatra or New York to every nine Jonathans. The advantages of this were discovered by placing a cut branch of these varieties in certain trees at flowering time. There was an immediate increase in yield in the surrounding trees. Mr. Muhlebach considers that it does not pay to rush trees into bearing quickly. His trees have been well cut back, and are surprisingly free of surplus wood, and show prolific development of fruiting wood. By these methods the satisfactory yield of between 4,000 to 6,000 cases is obtained. The planting

Portion of Mr. Muhlebach's "Retreat" dairy herd watering in the Moorabool River.

Some good comeback ewes at "Retreat."

is on the basis of 106 trees per acre. Before planting, the land was subsoiled to 18 inches deep.

The homestead is an attractive one, well provided with modern labour-saving devices. A feature of the farm buildings is a large barn with cellar.

"Narrawong," 360 acres, at Moriac, the property of Mr. Robert Purnell, is another highly developed and well-managed farm. The

same provision to extensive belts of shelter and shade trees that were so marked a feature in the two leading farms in this section was noticed here. The house is a modern bungalow, with attractive garden, broad planted drive, bordered with neat fencing. The water supply was superior to any seen on any of the other farms. There are three large dams; the principal is about 2,500 cubic yards capacity; it is equipped with an 8-ft. mill on a 30-ft. tower. The water from a 3,000-gallon tank on a 10-ft. stand is piped to stable, dairy, pigsties, garden, orchard, troughs, and supplements; the rain-water supply goes to the house.

The original object of this farm was to spell the working horses from Mr. Purnell's Geelong carrying business, but gradually a well-balanced farm has been evolved. To-day, the horses, while picking up condition and resting their legs from the effects of macadamized city roads, are utilized profitably in the growing of hay, peas, barley, and lucerne. Further, a number of remounts and lorry horses are bred. A

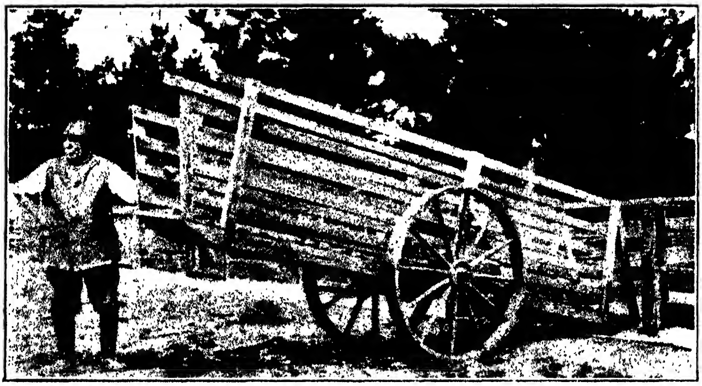
Attractive bungalow residence and planted drive of Mr. R. Purnell, "Narrawong," Moriac.

pedigree Jersey herd has been installed, and a stud of Yorkshire pigs has been got together.

As a rule, 100 acres are sown to oaten hay, either after bare fallow or dun peas, of which 25 acres are sown. This year, however, Mr. Purnell has made extensive plantings of peas, up to 100 acres, on an adjoining property. Twenty acres of Cape barley are sown for grain for the pigs, and 25 acres are down in lucerne. This latter can be irrigated to some extent from the main dam, if necessary. In all, some 45 acres are down in sown grasses, including subterranean clover, English rye-grass, prairie-grass, and lucerne in a mixture. On some wet rich flats showing traces of salt strawberry clover has been tried, but it has not made much headway. As an experiment, an acre and a half has been devoted to sweet clover (*Melilotus alba*), a biennial plant, sown at a rate of 4 lbs. per acre on some badly drained sandy soil. It

furnished satisfactory grazing. A few acres of swedes were grown last year on land heavily dressed with stable manure; they were sown in March on fallow. A yield of up to 35 tons per acre was obtained, and they were fed to the dairy herd.

On this farm careful attention has been paid to building up the fertility of the soil. Apart from the use of peas in the rotation system and the liming of 100 acres with agricultural lime, some 50 acres have been treated with a liberal dressing of stable manure. The horses stabled in Geelong provide 3 tons of manure per week. This is regularly carted to the farm and spread on land being prepared for lucerne or on the pasture, with most beneficial results. Seventy acres of well-ploughed fallow were noticed; 45 acres of this is being utilized for a further planting of lucerne, which ultimately will reach 100 acres. The new field is located near a new dam, made by throwing a concrete wall across a creek. From this storage the lucerne will be irrigated. As weeds are troublesome, lucerne is sown after fallow and in the spring.



A portable loading-race for pigs, in use at Mr. Purnell's farm at Moriac.

A hundred good Comeback ewes with lambs were noticed. Border Leicester rams are preferred.

The dairy herd, so far, consists of seven animals, including four pedigree Jerseys undergoing Government herd test, and one stud-book Jersey bull. The cows graze pasture and the lucerne. The pigs comprise four pedigree York sows and a boar, "Peter Pan," by "Peter Preston" (Baker blood), also four Berkshire sows. An average of about 60 pigs is maintained; these are housed in a row of well-constructed sties open to the east, and giving access to convenient paddocks of grass and lucerne.

Other competitors in the section were Messrs. Leigh Bros. and S. J. Lugg. Messrs. Leigh Bros.' farm, "Roseleigh," consists of 1,539 acres of black, grey, and chocolate stony land on the high volcanic plain in the Anakie district; rainfall 21 inches.

The principal activities are wheat, oaten hay, barley growing, and sheep-raising. The property is well improved, the homestead is an attractive one, and the farm buildings, especially the stable, in which

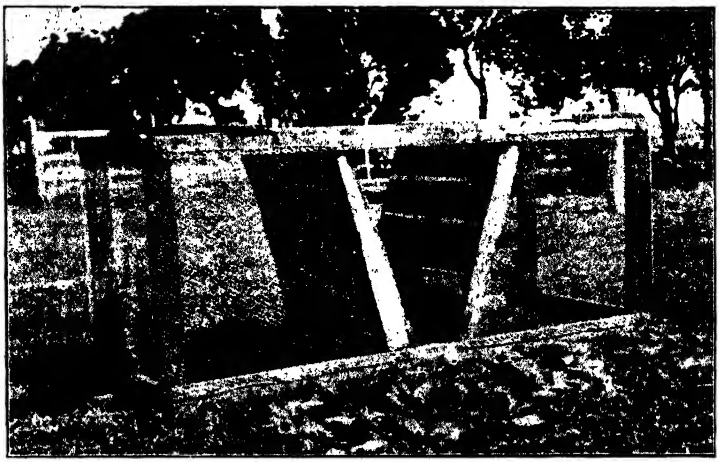
each horse is fed from a loft above by merely releasing a trap door in a funnel, are well planned. Useful shelter belts of sugar gums and wattles have been planted.

A commendable farming system is practised in which fallow precedes wheat and oats for seed, followed by oaten hay or barley on the stubbles. A feature is the provision for sheep feed on the stubbles following the hay and the barley. These paddocks are disked up in the early autumn, and oats, a bushel and a quarter per acre, sown with 60 lbs. "super."

Rape was tried, but it was not regularly successful; also weeds were sometimes introduced with the seed as obtained from the merchant.

The wheat yields average from five to six bags per acre. Federation is preferred, because it stands up well. Currawa and Yandilla King are also grown.

The sheep seen comprised 500 strong-wooled Comeback ewes of good type and conformation. Messrs. Leigh Bros. showed evidence of



An effective sparrow-trap used on the farm of Messrs. Leigh Bros., Anakie. (A twenty-four hours' catch—75 birds—is seen in the foreground.)

mechanical ingenuity in home-made devices, many of which have been installed about the place. One of these was an efficient sparrow trap near the poultry run; another, a wire in the stable along which the hurricane lamp can be moved from stall to stall; another the feeding device already referred to; and still another the tarred bag-sheeting stack covers noticed.

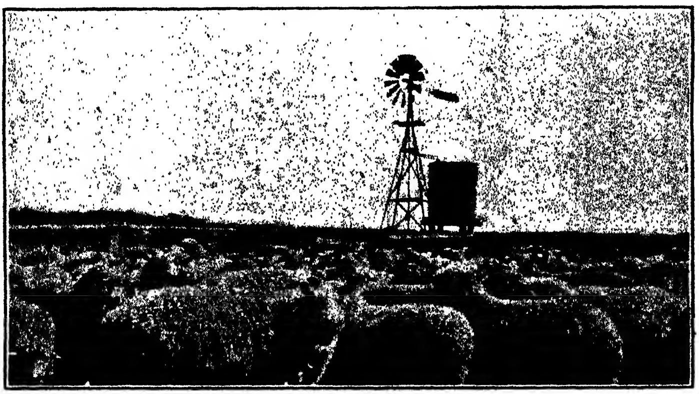
A feature of the home was the water supply and conveniences for the women folk in the shape of up-to-date washhouse, cool cellar, &c.

Mr. S. J. Lugg, "Iluka," Moolap, was at some disadvantage from a competition point of view in farming a leased property. There are 320 acres of very rich friable black volcanic soil fringing the seashore, 5½ miles on the Portarlington side of Corio Bay. The farm is subdivided into eleven large and five small paddocks. Wheat, oats, barley, and rye are

grown, and a small Border Leicester stud of pedigree sheep is maintained. The bulk of the crop is barley and oats, of which 100 to 150 acres are barley—the major crop—and the balance oats. The general rotation system practised is barley, oats, barley, oats, with an occasional change to wheat or a spell in grass. Little or no fallowing is done, but after the oaten hay is off the land is ploughed as soon as possible and thoroughly cultivated. The combined drill is used to seed the crops.

When the land is spelled in grass, English rye is laid down. Recently it has been shown that Alsike clover grows profusely here. It will be added to the mixture in future.

The soil and climate are ideal for barley, which averages from 18 to 19 bags per acre. The Cape type is preferred, though a little Duckbill and Pryor are usually sown. Duckbill, while not yielding as heavily as Pryor, is found to withstand the heavy "blows" off the coast better than Pryor, which, when ripe, is more easily stripped by the wind.



Border Leicester Sheep at Mr. Lugg's, Moolap.

For barley, a bushel and a half per acre, with 100 lbs. superphosphate, is used. The time of seeding barley preferred is the middle of July. Oats yield on an average seventeen bags, even though often fed off to sheep up till the end of July. May seeding for oats is preferred; a bushel and a half of Algerians is sown with 60 lbs. "super.," gradually increased to 100 lbs. later in the season. Wheat is sown at the rate of a bushel per acre, and rye rather less than 1 bushel.

Success has been obtained with silver beet for sheep feed. In 1919, a paddock, sown in September on a short fallow in rows 2 feet apart, at the rate of two and a half lbs. per acre with 1 cwt. superphosphate, furnished excellent grazing and lasted the full two years. It was ready for the first feeding off in November when 18 inches high. Subsequently it was available for feeding each month.

With the sheep, other than the stud, the general practice is to buy and sell after holding for a short period. Four hundred and fifty sheep were being carried on 45 acres of grass and self-sown Duckbill barley.

Homestead, &c., of Mr. J. J. Baker, Bannockburn, winner in Small Farm Section.

Usually 250 ewes can be lambed down on the grass land, with the aid of grazing furnished by the oat and barley crops. It is found advisable here to feed barley crops, if at all forward, up to the middle of September. The crops seen were very heavy, though showing a trace of carrot weed and a little charlock. Ten acres of oats were exceptionally good. It had been cultivated from twelve to fifteen times, with the object of killing weeds. By contrast with the surrounding crops less thoroughly tilled, it showed the benefit of thorough cultivation on this class of soil.

In eradicating charlock, Mr. Lugg has met with considerable success by ploughing early, then cultivating thoroughly, follow- with a late-sown barley crop.

A point of special interest on this farm was the use of a tractor for the bulk of the ploughing, cultivation, and harvesting operations. With its aid, all but four working horses have been dispensed with. It is stated to suit this particular country very well.

The Border Leicester stud is derived from ewes purchased from Mr. J. Sutherland, Lara, mated with a ram purchased from the Department of Agriculture, Werribee.

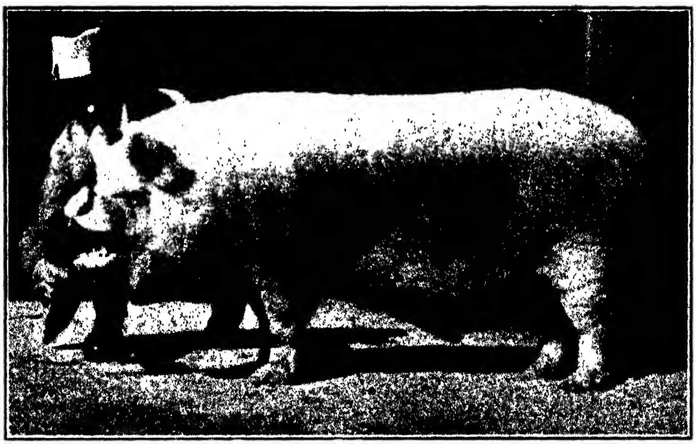
Section B.

(Farms less than 100 acres.)

Mr. J. J. Baker's farm, "Rosedale," Bannockburn, is situated on the fertile flats of the Moorabool. It is a striking illustration of what can be done on 91 acres where industry and intelligence are applied to

farming. Mr. Baker specializes in the breeding of pedigree pigs, principally of the Middle York breed. With these he has won a commanding position in the leading agricultural show rings in Victoria and New South Wales. In the 1921 Royal Show, Mr. Baker won with the boar under 15 months, and he bred the champion boar "Rosedale Bubble," and the Reserve Champion boar "Drayton's Chief." The blood of this stud was originally derived on the male side from the boar "Jumbunna Chief," a notable pig owned by Mr. Jenkins, of Korumburra. In all, an average of from eight to twelve breeding sows are kept, giving a total of 30 to 50 stud pigs.

In addition, there is a herd of twenty grade cows with Ayrshire blood predominating. The general practice is to grow 25 acres of English barley (Pryor) for pig feed. The husks of Cape barley are sometimes found to interfere slightly with the breathing of pigs—a disadvantage from a show point of view. The grain is crushed, moistened with boiling water, mixed with skim milk, and fed to the



Drayton's Chief—Two-year-old boar bred by Mr. J. J. Baker.

pigs while it is still warm. Mr. Baker finds that the pigs do better when fed in this way, especially in the winter months.

The young pigs are weaned at eight weeks; they go straight on to the barley and milk. Wheat, maize, and peas have all been tested, and wheat is found very good, and is preferred, if it can be obtained at a reasonable price. Young pigs that scour are allowed out to graze and root; this is found to effect a rapid cure. Mr. Baker remarks, with evident truth, that "earth is pigs' medicine." For market purposes the Berkshire-Yorkshire cross is preferred. The Yorkshires make the best mothers. The progeny are always pure white, and they mature quickly. Here bacon weight is made in six months. Ashes from the boiling copper are placed in each pig pen for health purposes, and lucerne hay is fed to some extent. Barley straw is used for bedding the pigs down, and when incorporated with the urine and dung is carefully preserved in a closely packed heap for future use; when well rotted it is placed on the farm crops.

Up to 20 acres of lucerne are maintained. This crop does well on these flats, despite the low rainfall. An irrigation plant has been installed. With this, water from the Moorabool can be applied in the summer when necessary. The lucerne is now renovated with a spring-tooth cultivator in the early spring, and top-dressed with superphosphate at the rate of 2 cwt. per acre every second year. When the lucerne declines in vigour, a couple of barley crops are taken off before the paddock is re-sown. This is to avoid the effects of lucerne sickness.

From 8 to 10 acres of oats are grown for the working horses. Mangels grow satisfactorily, but it is found that sows fed on them are difficult to get in young.

Forage crops of barley and oats mixed are sown after the first autumn rains for cow feed. The dairy herd graze these crops in the winter, and they have access to the lucerne for short periods, and to some natural pasture on the banks of the Moorabool. Three acres had been sown to peas for marketing while green.

Portion of Mr. Baker's grade dairy herd.

The homestead is a comfortable one, the buildings compact, and the paddocks well subdivided. An attempt was being made by Mr. Baker to erect a fence of home-made concrete posts. The subdivision was convenient, the paddocks being laid off a central lane.

Section C.

(Farms Settled by Soldiers.)

Mr. G. W. Evans' farm consists of 322 acres at Buckley, on portion of the Barwon Leigh station. When taken over in January, 1920, the place was bare of improvements. Now house, stables, bush implement-shed, and extensive pig pens have been erected. A mile and three quarters of subdivisional fences have been put up, two large dams excavated, and sawn-timber sheep yards constructed. The advantages of shade trees have not been overlooked, and a shelter belt of sugar gums has been planted near the house. Due care has been exercised in the construction and lay-out of the various buildings.

The crops sown include 70 acres of oats, 20 acres of barley, 10 acres of dun peas, 12 acres of rape, and 15 acres have been fallowed so far. Portion of the land is suitable for root crops, and may be sown with onions next year. The crops looked well.

Mr. Evans showed considerable resource in turning his barley into profit last year when he was unable to obtain a satisfactory price for it. He erected a series of pig pens of approved construction, purchased suckers and slips, and fed his barley crushed to the pigs, together with a little milk from h's solitary dairy cow. The result was that he was able to quit the barley and the pigs at a profit.

The stock on the place consists of five draught horses—in somewhat low condition—and 70 crossbred ewes with lambs. The property has been well developed considering the short time that has elapsed since it was taken over, and the lines on which it is being farmed are sound. If anything, the cereal crops had been sown somewhat on the late side.

A digger's pig-pen of economical construction. (Mr. F. W. Evans', Buckley.)

Mr. L. C. Kelly, who secured second prize, has a well-balanced farm at Anakie, consisting of black volcanic clay soil with a few boulders on the high plain, rich, friable, chocolate soil on the western slopes of Sutherland's Creek, and light sandy lands on the east side. A neat homestead has been erected in a horseshoe bend of the creek in a central and sheltered position. A good start has been made, and a considerable area of stones cleared. The crops seen were exceedingly creditable; they comprised 30 acres of Major wheat, 40 acres of Engl'sh barley, and 82 acres of oats. The farming system followed is—Fallow, wheat, oats, barley for the high ground; and fallow, oats for the light soil.

Ten bags of wheat per acre were obtained from Major last year, thirteen bags per acre of English barley, and sixteen and a half bags per acre of Algerian oats. The crops look equal to that this year. Pryor is the variety of barley preferred. As yet Mr. Kelly has no sheep.

At Wallington, on 120 acres of the Chevy Estate, sandy loam, with black and chocolate volcanic soils, Mr. B. Maddox, the third competitor in the Soldiers' Section, has taken up a block under the Repatriation scheme. He is dairying, and has got together a herd of thirteen cows, of which nine are in milk. Some 36 acres are sown in crop, including 15 acres of oats for forage, 26 acres of oats for hay, 7 acres of dun peas for grain, 3½ acres of Federation wheat, 12 acres of millet, are to be sown shortly. Near the homestead, the sandy loam is adapted for market gardening. A quarter of an acre of swedes netted £24 last year. A few acres of cabbages and cauliflowers will ultimately be sown.

The place has been well developed in the twenty months it has been settled, and there are convenient improvements, most of which have been erected by Mr. Maddox. Two pigs are kept. The crops were good,

A "digger" at work. (Mr. L. C. Kelly clearing basalt boulders off his land.)

especially the oats and peas, but some trouble is being caused by land infested with weeds such as charlock.

General Comments.

DRAINAGE PROBLEMS.

Much of the land south of Geelong, especially in the Moriac district, suffers from excessive moisture in the winter months. Up to the present few farmers have seriously tackled the problem, believing that expensive tile drainage is the only remedy. But certain methods of cultivation have been shown to do much to remedy the evil, and they are comparatively inexpensive. The land should be ploughed with the mould-board plough in lands not exceeding one chain in width, and the same lands should be "crowned" up for several successive ploughings before being alternately split and gathered in the usual manner. The effect of this is to ridge the land up into a series of gentle self-draining undulations. The method has proved a great success on a 100-acre field

at Rutherglen, which suffered badly from waterlogging each year before the work was done. The beneficial effect can be further enhanced by the delving of judiciously placed surface drains, where necessary, to prevent water from adjacent fields entering the cultivation paddocks. If the farmers in the wetter parts of the Geelong district will resolutely attack the problem along these lines, their present troubles will be largely overcome, and at little cost.

SUBTERRANEAN CLOVER.

This hardy plant is specially adapted for improving the carrying capacity of land where the quality of the soil and the amount of the rainfall are not sufficient to render profitable the sowing of ordinary English rye grass and clover mixtures. It will usually take possession of areas where the rainfall is as low as from 23 to 26 inches. In some parts it has done satisfactorily on light soils, where the average rainfall is not more than 21 inches. It is able to withstand the dry summer under these conditions because it re-establishes itself each year from seed, and unlike most other annual plants, it is specially equipped with a mechanism which actually plants a large proportion of its seeds in the soil. Experiments by the Agricultural Department, and on private farms, have shown that it will develop wonderfully on the poor light soils at Cavendish. It does well also at Glen Thompson. A test made at Goroke shows that it flourishes on light soils there on a rainfall of 21 inches. The success on "Grassdale," at Moriac, already instanced, is a concrete illustration of its powers of improving the carrying capacity of the soils in that district. The seed is somewhat costly, but success can be obtained from very light seedings per acre if the work is carried out as follows:—

The experience is that it is preferable to use a light seeding of the clover with a cover crop than to sow a heavier quantity by itself. Thus a couple of pounds sown with an oat crop, with 112 lbs. "super.," will usually furnish a better stand than from 4 or 5 lbs. sown by itself, also with manure. A classic instance of this was noted at Grassdale. Similarly a light seeding at Cavendish on the Government experimental plots on the farm of Mr. John Moren made great headway wherever self-sown oats from the year before made its appearance.

The effect of the clover crop is to cause the clover to send out extra long runners, some plants readily attaining a diameter of 2 to 3 feet in a few months. Further, the grass cannot be disturbed by stock till after harvest. If subterranean clover is sown without a cover crop, and cattle placed on it in the spring, the runners are readily pulled up, and the spread of the plant by seed is greatly checked.

Recent tests at Glen Thompson, on the Glen Ronald Estate, at the Government Experimental Field there, have shown that subterranean clover can be established satisfactorily by merely drilling it across the ordinary pasture land, provided the land has been previously top-dressed with superphosphate, and preferably superphosphate and lime.

Subterranean clover was drilled across the 10-acre field of variously top-dressed pastures on the farm of Mr. W. Floyd, Glen Thompson. A luxuriant growth of subterranean clover was obtained only where the land had been top-dressed. The seed did not germinate where there

was no top-dressing. At the present time the pasture presents a remarkable sight. Burr trefoil, slender trefoil, and white Dutch clover were also tested in the same pasture. Of these, slender trefoil was the only one to strike satisfactorily. It behaved precisely like the subterranean clover.

Tillage at Moolap.

The soils on the Moolap flats are rich, black, and friable. They are readily brought into a suitable texture for seeding. Because of that they are often deprived of the cultivation that more refractory soils receive. But some farmers, in eradicating weeds, have been compelled on individual paddocks to till the land unusually well. Mr. S. J. Lugg is one of them. The effect has been to considerably improve the yield of the crop. This should cause others in the district to test the effect of more thorough cultivation, whether weeds require it or not. They will almost certainly find, because of the extra stores of available plant food thus created, that the yields of the crops can be profitably increased. These soils have a similar texture to the Wimmera black soils. The modern Wimmera scarifier—one of the most effective tillage implements and weed killers yet invented—would be invaluable on this class of land. It works well in sticky soils such as these.

Dun Peas.

Hitherto dun peas have been mostly grown on rich volcanic soils, but the marked success of this crop on lighter soils at Geelong should encourage farmers in other districts with similar rainfall to grow this crop more regularly. Besides furnishing satisfactory cash returns, peas are a valuable soil renovator. A remarkable instance of their value in this connexion is to be seen this year on the Government experimental plots on the farm of Geo. Kerr, Strathkellar. Where oats have been sown after peas the crop is considerably better than where no peas were used. Peas, of course, can be grown in fairly dry districts if fallow is used, but judging by tests at the Research Farm, Werribee, the benefit conferred on succeeding crops by the extra nitrogen placed in the soil by the peas does not compensate for the drain on the soil moisture. In wetter districts, however, the advantages of peas in the rotation system are considerable.

Mr. Kerr uses his peas mainly as forage for sheep. They are fed when ripe in January, and are found invaluable for topping-up sheep. When harvested for grain considerable labour is involved; but it is claimed for the modern header that, with simple modification, this will pick up and thresh peas satisfactorily.

PASSION FRUIT CULTIVATION IN VICTORIA.

By J. Farrell, Orchard Supervisor.

Introduction.

The passion vine (*Passiflora edulis*) belongs to the natural order Passifloræ, and the place of its origin is Southern Brazil. There are probably over 200 known species of this order, many of which yield edible fruits, but, because of its being so amenable to commercially successful cultivation in Victoria, *P. edulis* is made the principal variety grown here. America is regarded as the home of most of the species of this order, as some are found in different parts of the United States, including Pennsylvania, Illinois, Florida, also Mexico, Central America, and the West Indies, while others belong to Guiana, Peru, Bolivia, and the La Plata States. From this it will be observed that plants of this genus are naturally favoured by tropical or sub-tropical conditions, as the places mentioned mostly lie between 45 degrees north and 35 degrees south latitude.

Although the primitive home of *P. edulis* is confined mostly to that portion of Brazil which lies between 20 degrees and 30 degrees south latitude, this variety is capable of adapting itself to a comparatively wide range of climatic conditions, and will make good growth, and yield heavy crops of fruit, except where severe frosts occur, when the young wood often becomes badly affected. Individual vines thrive and fruit well in and around Melbourne as well as in most parts of Victoria. The localities of the State, however, where passion fruit is grown commercially, include Wandin, Seville, Silvan, Monbulk, and Mount Dandenong, and the portions of these localities where it is grown have an altitude ranging from about 500 feet to 1,500 feet, and they lie between 37 degrees and 38 degrees south latitude.

Experience has taught that elevations or gentle slopes make the best sites for passion plots, as there is now an ample accumulation of evidence to show that the vines should not be planted in low-lying secluded valleys in which frosts are pocketed.

New South Wales and Queensland also offer a genial home to the passion vine, and it has been cultivated commercially for some years in these States.

History of the Development of Passion Fruit Culture in this State.

To the late Mr. Christopher Thomas Briggs, a pioneer fruit-grower of Wandin, is due the credit of having commenced passion fruit culture on commercial lines in this State. Mr. Briggs began in 1892 by sowing a few seeds which he obtained from the fruit of a plant growing at the residence of Mr. G. E. Overton, a local gardener. The young vines made good growth, and when one year old, about forty were planted out in a row 9 feet apart. The next year the block was increased to half-an-acre, which was extended to 5 acres during the few succeeding years. Mr. Briggs, junior, states each row of vines was supported by a trellis 9 feet high made of posts from rough split timber, with seven 8-gauge

wires, and a continuous line of saplings nailed along the top of the posts. The vines yielded well, and owing to the height of the trellis ladders had to be employed in picking the fruit.

The product of the variety under consideration is at first of a pale green colour, but as its development proceeds the fruit becomes darker until, when fully matured, it is dark purple, and is consequently commonly known among the growers as the "black passion."

At first, Mr. Briggs experienced difficulty in selling his passions, often accepting as low as 4s. per case for them. As the public developed

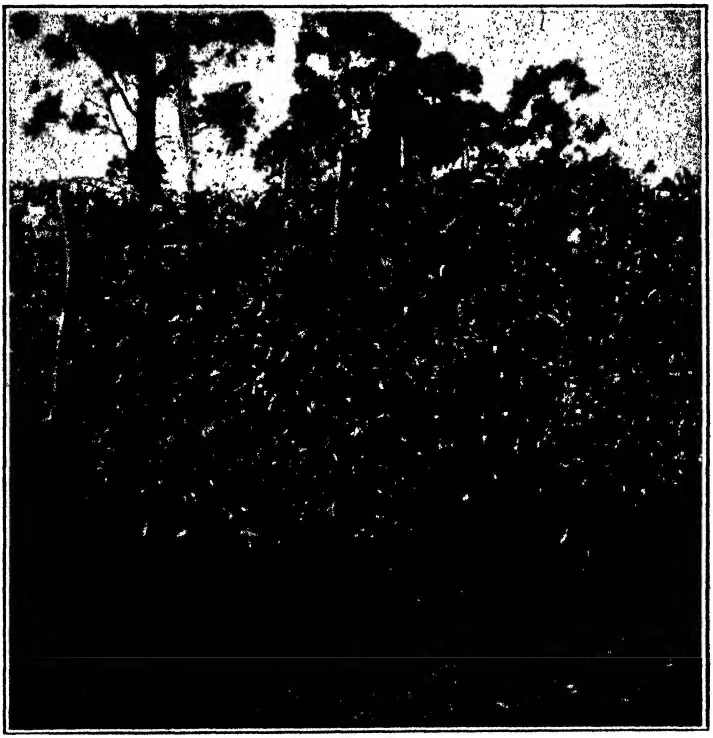


Fig. 1.—A three-year-old passion vine in its winter condition.

a liking for this class of fruit, however, prices went gradually up to 8s., 10s., 14s., and sometimes £1 per case. Some growers obtained as high as £2 per bushel case for their late crop this year (1922). Certainly this crop was light, but the prices paid indicate the public liking for passion fruit.

Fig. 1 shows a passion vine three years old in its winter condition.

Mr. Briggs' sons also commenced growing the passion, and its cultivation became general in the district, having been taken up by Messrs. Hogg, Johnson, Hunter, Anker, Aitken, Baker, Sebier Brothers, and

others, and later, growers in the neighbouring localities gave it a place in their orchards.

The Government Statist has supplied the following information regarding the quantity of passion fruit grown in Australia during the last few years:—

Year.	Victoria.	New South Wales.	Queensland.	Total.
	Bushels.	Bushels.	Bushels.	Bushels.
1918–19 ..	10,447	49,049	5,553	65,049
1919–20 ..	17,635	58,901	3,707	80,243
1920–21 ..	10,775	24,819	10,375	45,969

The estimate for 1921-22 for Victoria is 16,759 bushels. It may be interesting to know that in 1918-19 6,840 bushels of passion fruit were produced in Norfolk Island. No later figures for that place are available.

Because of the ever increasing demand for passion fruit, the area under vines in the districts which have proved suitable for their cultivation is being considerably extended. There are also many new blocks of land being planted this year, and growers are looking forward to the still further successful cultivation of this fruit.

Up to the present the local markets have been capable of absorbing all the fruit produced here, but in consequence of the rapid extension of the areas under cultivation, it has been deemed desirable to make provision for sending a possible future surplus to oversea markets. With this object in view the Department of Agriculture is conducting a series of cool storage and other experiments to prevent the usual wilting of the fresh fruit, so that it may export satisfactorily. A firm in Melbourne has commenced "processing," and in this way some of the surplus, and most of the fruit affected by the fungus (*Gloeosporium*) may be utilized. Experiments are also being carried out in the fruit-growing centres to further test the relative efficacy of the different fungicides against this disease.

I.—Situation and Climatic Condition.

The passion vine's aversion to cold climatic conditions is now well known, and it is a matter of paramount importance that, when selecting a situation for the passion plot, this aspect of the question should receive the first consideration. Light frosts do this vine little or no damage, but fairly heavy ones affect it badly. It thrives and fruits best in a warm, humid atmosphere such as that obtaining in the sub-tropical country of its origin. It is obvious, therefore, that when planting in this country, conditions similar to those should be sought. It is unfortunate, however, that the climatic conditions which favour the growth of the vine are even more favorable to the development of the wood, leaf, and fruit fungus which attacks it, but, as previously stated, measures are being taken to cope with this disease.

The passion vine is an evergreen, and makes a little growth during mild winters, and occasionally growers find to their cost that it should not be planted in cold, low-lying situations, especially between hills, where it is most likely to be attacked by winter frost, the effect of which

is more severe on plants which suffered from *Gloeosporium* during the previous late summer and autumn than it is on healthy ones.

In hilly country the site for the vine plot should preferably occupy an elevated part with a gradual slope to the north or north-east, and plants do well on the north-west slope, provided the site be nicely sheltered. Southerly slopes are mostly avoided, but even on these, if not too abrupt and suitably sheltered, good crops are sometimes harvested. Passions like shelter, and are not averse to a reasonable amount of air circulation, but they abhor wind-swept positions, and particularly during winter. No hard and fast rule can be laid down in this regard, but intending planters should give the matter the consideration it deserves. and to determine the needs of individual cases. In these undulating localities sufficient shelter is sometimes afforded by the lie of the land, as adjacent hills often intercept prevailing winds. Then in grubbing the site for the passion plots belts of native timber are allowed to remain as shelters. Where these natural advantages are absent, however, break-winds of *Pinus insignis*, gums, or other suitable trees, are employed.

II.—Soils.

In the case of the other fruits both large and small, we have an extensive knowledge of their likes and dislikes for the different classes of soils; with the passion, however, our knowledge of its requirements in this regard is limited. This is because of its comparatively recent introduction to the ranks of commercial fruits here, but evidence of its requirements as regards both climate and soils is rapidly accumulating. Up to the present, the fairly rich, red friable soils of Wandin, Seville, Silvan, Monbulk, and Mount Dandenong seem to have come nearest to the liking of this plant. It also grows well at Welshpool and Yarram, in Gippsland, and experiments are being made to test its appreciation of the rich siltations at Bacchus Marsh, the black volcanic soil of the Red Cross Farm, at Janefield, also those in other parts of the State.

Two well-developed passion fruits about four-fifths natural size are shown in Fig. 2, A and B; (*c*) and (*e*) are cross sections of A; while (*d*) and (*f*) are longitudinal sections of B. These fruits, although of a late crop, were of good quality and well " filled."

The soils of the districts in which passions are grown commercially here are deep, friable, and fairly rich, but are of a rather porous, loose, or open construction, and are, therefore, liable to dry up quickly. These districts being hilly, however, have a fairly heavy rainfall, and sufficient capillary moisture for the use of the vines is maintained by intensive and continuous cultural treatment of the soil during warm weather.

There seems to be no reason why the northern irrigation areas should not be suitable for passion fruit culture, but sufficiently extensive experiments have not yet been carried out to settle the question.

Individual vines thrive and crop well in many of the private gardens on the lighter grey soils around Ringwood, Bayswater, and several other places, and one is forced to conclude that this plant is more particular concerning climate than it is in regard to its choice of soil.

As well as differing vastly in construction and texture, the relative quantities of the different elements of plant food in the red soil mentioned vary considerably from those of the lighter soil of Ringwood,

Tunstall, &c. Samples of both soils were sent to Mr. P. Rankin Scott, Chemist of Agriculture, for analysis. Hereunder is a copy of Mr. Scott's report. Samples Nos. 1 and 2 are surface soil and subsoil from Monbulk, Nos. 3 and 4 are corresponding samples of the light soil from Tunstall:—

Nos. 1 and 2 from Monbulk.

Nos. 3 and 4 from Tunstall.

The samples, on analysis, were found to contain—

	Parts per 100,000.			
	I.	II.	III.	IV.
Nitrogen	212	187	117	58
Phosphoric acid	96	80	32	25
Potash	123	98	67	98
Lime	116	44	40	30
Magnesia	116	74	92	136
Chlorine	8	8	4	4
Reaction	Slightly acid.			Acid.

The red soils, notwithstanding their relatively high content of plant food, as shown by the analysis, are not as suitable for apple and pear growing as the lighter soils, but small fruits do well on them. The object of giving the analysis here, however, is to show the different conditions under which the passion seems to thrive.

III.—Raising Young Plants.

Young vines are raised from seeds, which should be saved from fruit ripening from April to June, as these give a higher percentage of germination and strong plants than those ripening at any other time. The need for careful bud, scion, and seed selection when propagating other fruit trees is now generally recognised, and it is desirable also when establishing a passion fruit garden that this principle should be observed. The seeds for propagation purposes should be taken from the large fruits of vigorous healthy plants known to be precocious and prolific bearers. These fruits should not be picked until fully matured, then allowed to wilt and dry naturally, and afterwards kept in a dry cool place until the seeds are required for sowing. The seeds may be sown in drills in beds or boxes from the end of September until the beginning of November, according to weather conditions prevailing locally. The best plants are those grown in the open, the earlier the seed is sown the better, and the young vines may be protected from late frosts with the boughs of trees, with hessian or other suitable material. Before sowing the seed the soil should be brought to a fine state of tilth, and the seeds may be covered with an inch of fine earth. The seeds soon germinate, and the young plants appear above the ground, and if the soil be kept free from weeds and nicely watered during the summer the result is usually what is desired.

Seedlings are depicted in Fig. 3. A gives section of a bed, and B shows them growing in a drill. Those in the bed made the better growth, the seed having been sown earlier than that for those in the drill, and on account of having received more attention than the latter during the main period of growth. The writer would recommend the drill system, because the soil between the drills can be kept cultivated and the stems and lower parts of the plants would get more light and

air than those grown in beds. The seedlings should not be allowed to grow too thickly, and the weak, useless ones should be weeded out so as

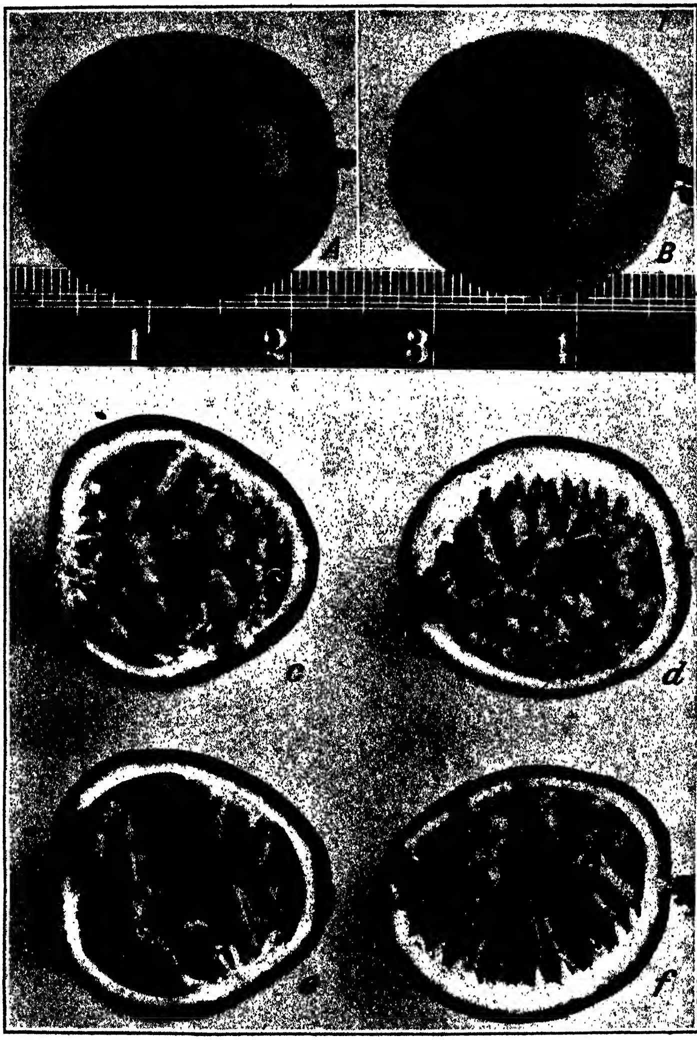


Fig. 2.—Two passion fruits, A and B.
c and e are cross-sections of A.
d and f are longitudinal sections of B.

to give the good plants sufficient room. The best results are obtained when the seedlings are allowed a reasonable amount of space—about

6 inches apart, and while growing in the nursery their stems should be kept single, without side shoots, to a height of from 4 to 6 inches above the soil level.

The matter of producing young vines is a comparatively simple one. and growers should raise those required for their own use. Then, when establishing or extending the plot, the young vines are on the spot, and it is only a matter of carefully lifting out each one with a spade, keeping its soil and roots intact, and placing it in its permanent position. When planting takes place under these conditions, the results are much more

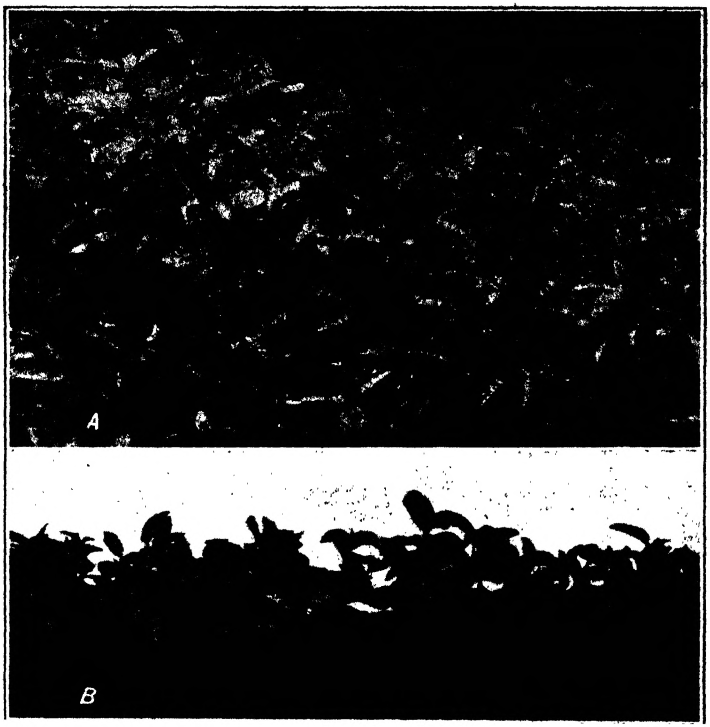


Fig. 3.—Seedlings growing—A, in a bed; B, in a drill.

satisfactory than when the foliage branches and roots of the young vines are crushed and broken in transit from one place to another. Seedlings raised under glass or forced with heat are not recommended, as they are usually of a yellowish colour, delicate, and rarely grow into as strong and profitable vines as those raised in the manner explained. In order to obviate injury to plants in transit, seedlings are sometimes grown in pots and forwarded in them to growers, but potted plants are also inferior to those grown in the open.

(To be continued.)